SCIENCE 4

FOR CLASS - IV

SINDH TEXTBOOK BOARD
JAMSHORO

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Preface

It is a matter of great pleasure and satisfaction for me to iterate that the Sindh Textbook Board has been providing the students of the entire Sindh province, with textbooks of worthy standard from the point of its inception till now. On one hand, these books are quite affordable; on the other hand, their publication and availability is being managed in a timely and efficient manner.

The main ideology behind these textbooks is that they must contain knowledgeable, qualitative material in order to impart in our students, the skills that can help them compete in today's ever changing and challenging world. The present global scenario demands that first and foremost, our new generation must be well conversant with the Islamic ideology; then it must possess an exemplary character, a high degree of patriotism, and a sense of responsibility, brotherhood fraternity and equality. The possession of all these qualities will assist them in their studies in general. However, acquisition of these skills is all the more important particularity in science teaching and learning, if the students are to actively participate in new scientific research and inventions, and develop awareness, soundness of mind and a progressive mind set.

Our students will be able to achieve success and economical stability and lead a prosperous and successful life only when they are able to master these skills. Along with these skills our students will have to develop inquiry, communication, critical thinking and problem solving skills for a bright future. Having a bright future, they will be able to ultimately hold the reins of their country and provide it the much needed prosperity and economic soundness. They will become model citizens of their country and nation in shape of learners, implementers and innovators.

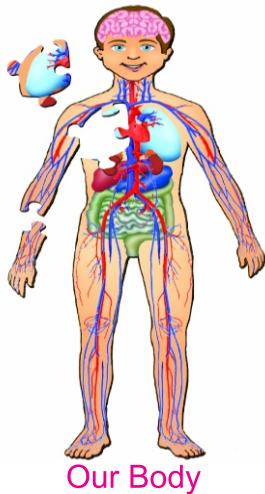
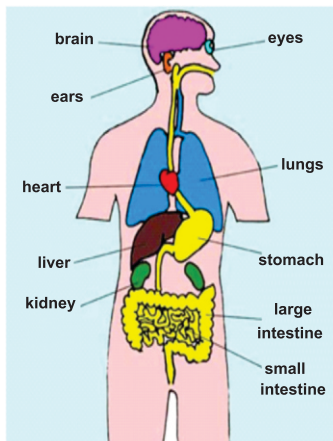
With objectives and intentions of such noble national spirit, the Sindh Textbook Board is introducing this book of "Science Grade-4" for new entrants in the field of education. This book has been written by well-experienced authors and reviewed by senior educationists in accordance with the "New Curriculum 2006" for inclusion in the syllabus. Thus, the Sindh Textbook Board is quite hopeful that the teachers, students and other respective stakeholders will benefit from this book.

Lastly, it is requested that in case there are any concrete recommendations(s)/suggestions from your side with reference to the material contained in this book, feel free to convey them to us, so that they can be incorporated in the subsequent edition.

The Chairman,
The Sindh Textbook Board, Jamshoro.

OUR BODY

Our body is made up of different parts, all the parts work together to keep us alive. Have you ever thought of the parts that make your body? How do the parts work together to keep you alive and healthy? What make your fingers move? Why do your eyes blink? How do you breathe? What does your body need to perform all functions properly?

Our body has different parts which perform specific functions.

Our Body

In this Chapter you will learn about:

- Major body parts of your body and their functions (Teeth, Bones, Muscles, Brain, Lung, Heart, Stomach, Skin, Eye, Nose and Ear).
- Common Disorders of some parts of Your Body (Skin, Teeth and Stomach).

All the students will be able to:

- Identify major parts of the human body.
- State the functions of the major parts of the human body.
- Describe how bones and muscles work together to produce movement.
- Identify common disorders of various parts of body and their causes.
- Suggest ways to keep parts of your body healthy.

Major Body Parts

Identify major parts of the human body:

The human body is made up of many parts, such as the nose, legs, heart, liver, lungs and many other parts. All body parts are different from one another and are working together to keep you alive. All parts work in coordination with one another, and perform their own function to keep you working and alive.

Activity 1.1

Identifying major parts of your body:

What do you need?

Flash cards having pictures of the following major parts of the human body:
Teeth, Eyes, Nose, Ear, Muscles, Bones, Brain, Lung, Heart, and Stomach (One set of cards for each group).

What to do?

1. Work with your pair or in a group.
2. Sort these cards into two groups:
   Group A: Body parts located on face.
   Group B: Body parts not located on your face.
3. Draw the outline of body and face on the Board / Chart / Paper / Notebook.
4. Paste the body parts on the outline of Face and Body.
5. Locate and point to the body parts present on your face and the whole class should also do the same.

Teacher's Note: The teacher needs to divide the class in groups and give one set of cards to each group. The teacher needs to draw the outline of Face and Body on the Board/Chart and ask the students to paste the parts.

Major Parts of the Body and their Functions

State functions of major parts of the body.

Do you know the function of your body parts? Find out the facts about your body parts. Talk to your peer, teacher, doctor and family members. Visit the school library and Internet. The body is made up of different parts and each part has a different and specific function; they are:

Brain

How do you recognize different things? How do you remember the way to your class? The part that controls all these and many more functions in the body is called the brain. The brain is the central control system of your body. Your brain directs all the activities of the body, such as seeing, hearing, thinking, feeling, and remembering the events. The brain is safely placed between the thick bones of the skull, which protects your brain from injuries.

Figure 1.1 Human Brain

Do you know?

A headache is not a pain in your brain.

An adult brain weighs about 1.4 kg

Unlike most other organs, injury to brain cannot be cured, as it cannot regrow after damage.

Teacher's Note: The teacher should ask the students to find out the functions of body parts and share them in the class. The teacher should select a group of students from the class to role play the body parts. The group of students should explore, write and rehearse the dialogues for the role play: "I am a heart; I am located in the chest. I am an important part of the body." Another group of students could develop a poster on body parts and list of questions to further explore and present the functions. The teacher also needs to ensure that students use the key words given in the text on body parts in their role play and posters.

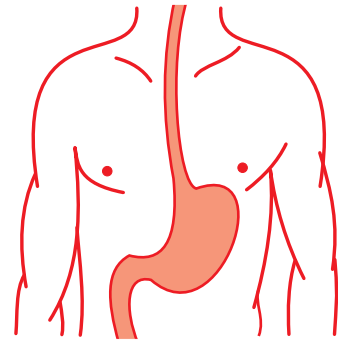
Stomach

Figure 1.2 Stomach

The food you eat, the sweets you eat and the drinks you drink, all go down to your stomach. The stomach is like a J-shaped bag.

The stomach performs three important functions:

1. It stores the food.
2. It breaks down the food, digests it and converts it into a liquid like mixture.
3. It passes the liquid mixture to another body part, the intestine, for absorbing all the nutrients from it.

Sometimes, when you eat more than your appetite, your stomach expands to store that food. However, over-eating or eating spicy food causes obesity and ulcers.

Food for thought

Do drinking carbonated drinks help in the process of digestion?

Do you know?

The stomach works like a mixer. The stomach churns and mashes together all the small balls of food into smaller and smaller pieces. The juices that digest the food in the stomach also help kill bacteria that might be in the food you have eaten.

Teeth

You have two sets of teeth, these are:

(i) Primary teeth (milk or baby teeth)

Figure 1.3 Teeth

(ii) Permanent teeth. A three years old child has 20 primary teeth and adults have all the 32 permanent teeth. The function of the teeth is to help you chew your food, so that it can be digested more easily.

If you don't brush, miswak or floss your teeth regularly, it will lead to the formation of cavities and plaques which make the teeth under go a decay process and make it painful for you to chew food.

Ear

Ear is the body part for hearing and maintaining the body's balance. It detects different types of sound, including pleasant sound and noises. The ear is made up of internal and external parts. The part of your ear which is visible and also shown in the picture below is called external ear. Some people cannot hear properly and use hearing aids, which help them listen properly.

Figure 1.4 External ear

Elephant's have large ear flaps that help them to control the temperature of their body. African elephants have larger ears; while Asian elephants have smaller ears.

Nose

A pot of biryani on the stove. The animal dung in the backyard and the rubbish in the dustbin. How do you smell these smells and many more? That's right! It is through your nose. The basic function of our nose is to draw in air and identify the different smells and aromas present in the air. It has two holes in the nostrils; through the nostrils, it takes the air from our surroundings and passes it to the lungs. It also passes out the bad air from the lungs to the surrounding.

Figure 1.5 Nose

Teacher's Note: The teacher may call one student to the front of the class and talk about ear. The teacher may ask students to develop large funnel shaped external ears or scoop with hands around external ears and listen to the student. Now take away the scoop around the ear and try to hear the students talk. Ask the student what was the difference in both the situations.

Explore:

Why your nose do runs?

Why do some people snore?

The nose also warms, moistens, and filters the air before it goes to the lungs.

Lungs

Lungs are the breathing centre of the body. Lungs are two soft spongy large balloon like organs located in the chest. The delicate lungs are protected by a cage of bones. This cage is called the ribcage.

Figure 1.6 Lungs

The air which is inhaled (taken in) through the nose enters the lungs. The air you breathe in has a gas called Oxygen. When you breathe in, the air with oxygen gets into your nose. Inside your nose, you have tiny hairs. These tiny hairs trap dirt from the air. Your nose also makes the air moist and warm.

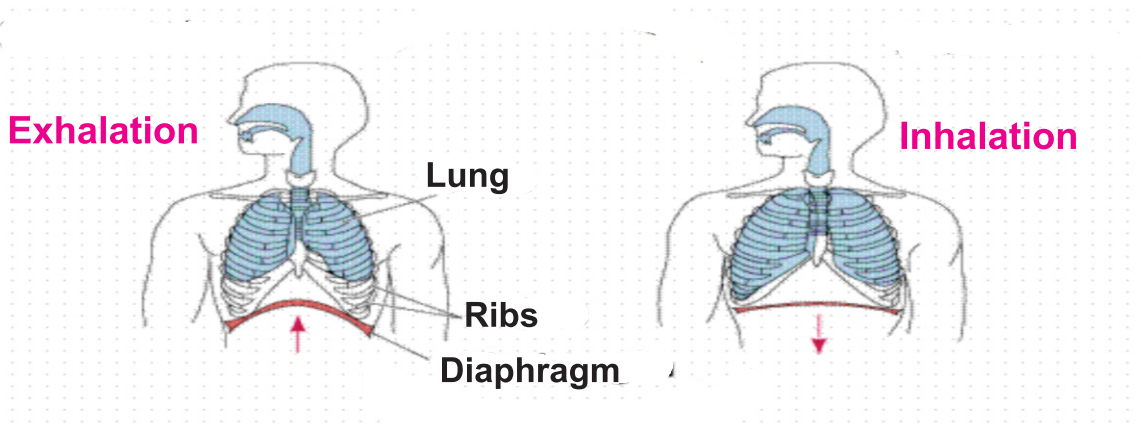



Figure 1. 7 Inhalation and Exhalation

The clean, moist and warm air enters the wind pipe is called trachea. It is a hollow tube in your chest. The trachea is divided into two smaller tubes called bronchial tubes. Each bronchial tube is joined to each lung. The air you breathe in enters the

Lungs through the wind pipe. Lungs absorb Oxygen from the air and gives out carbon-dioxide. When you exhale the air back out through the nose, carbon-dioxide leaves your body.

Asthma and Lung Cancer are the main disorders of lung. You can protect yourself from these disorders by avoiding inhaling polluted air and smoking.

Activity 1.2

Feel your body breathing:

Place your hand partly on your chest and partly on your abdomen. Keep it there. Take a deep breath. What did you feel?
You felt your chest expand. Now breathe out. What did you feel? You most likely felt your chest contracting. You also may have felt your abdomen extend.

Eating food in a hurry or speaking during eating can choke your wind pipe. Instead of going into the food pipe, the food will go to wind pipe. How do you get the food out of the wind pipe? Find out from your friends or elder brother or sister.

Figure 1.8 A Choking Child

Teacher's Note: The teacher could demonstrate simple first aid measures in class to the students.

Heart

Figure 1.9 Human heart

Heart is the pumping station of the body. Your heart pumps blood to all parts of the body through blood vessels. It is located a little to the left from the middle of your chest. Heart is about the size of your fist. The average human heart beats about 72 times in a minute.

Do you know about any Heart Diseases. Heart diseases are high blood pressure, hardening of the blood vessels, chest pain, heart attacks and strokes.

Describe how bones and muscles work together to produce movement.

Muscles and Skeleton (Bones)

Figure 1.10 Skeleton

Your muscles and your skeleton (or bones in your body)work together and enable you to move. How you stand, how you sit, how you walk or even how you lift things are all examples functions of the muscles and the skeleton. All the bones of the body make the framework called the skeleton. There are 206 bones in your body. Your bones grow as you grow. The function of the skeleton is to support and protect the human body. It also protects and supports the internal organs of the body. Can you name some of the organs protected by the skeleton? Skull protects the brain. Ribs and breast bone protect the heart and lungs.

- *Humans are born with 300 bones but since many fuse together; hence, adults have around 206 bones.*
- *With 26 bones in each foot and 27 bones in each hand, over half of our bones are in our hands and feet.*

Activity 1.3

Count and Write the Number of Bones in your Hand: _______ .

Figure 1.11(a) Bones of hand

Activity 1.4

Count and Write down the Number of Bones in your foot: _______ .

Figure 1.11(b) Bones of foot

Teacher's Note: The teacher could make a chart for counting the bones activity.

These are the pictures of joints in a human body. Places in the body where two bones meet are called joints.
Different kinds of joints in the body allow bones to move in different ways. Find these joints in your body and feel them.

Figure 1.11(c) Joints

Activity 1.5
Feeling joints

Move your arm upwards by raising your arm higher than your shoulder. Now move your arms downwards by bending your elbow, sit down by bending your leg at the knee joint. You have noticed that you can move different parts of your body at different joints, i.e., Shoulder, Knee and elbow.

Your body has muscles of many different sizes and shapes. All the muscles together make up the muscular system. There are about 639 muscles in your body. Skeleton and Muscle work together to support your body and move it forward.

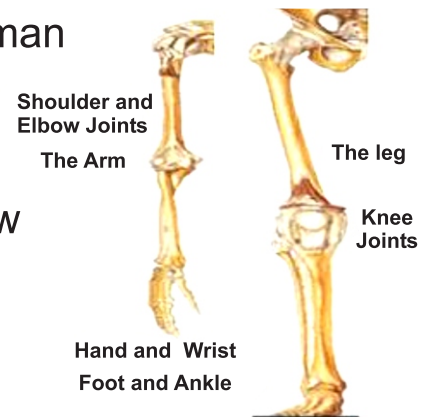



Figure 1.12 Muscles

Figure 1.13 Muscular Contraction

In order to move a bone, a muscle contracts. In this process, it gets shorter and pulls the bone it is attached to. Muscles also help and protect the inner, delicate parts of your body.

Skin

Skin is the outer layer of your body. It is the largest part of the body as it covers the whole body. It is 2 millimeters thick. It

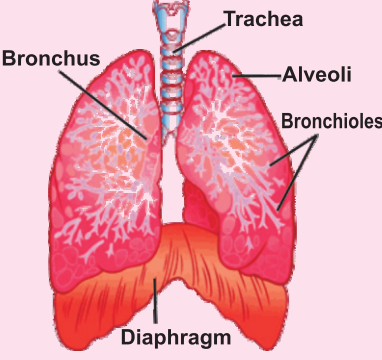
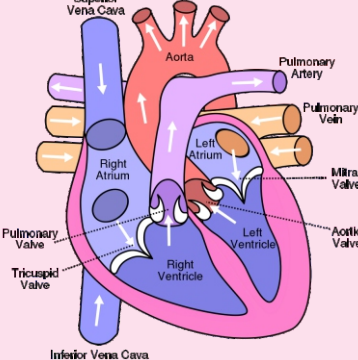
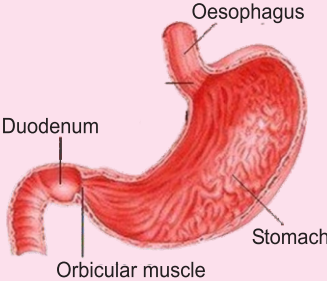
Figure 1.14
Sensitive to Touch

Figure 1.15 Sensitive to Temperature

Figure 1.16 Sensitive to Pressure

performs many necessary functions, such as protecting internal organs from injury and preventing infection. The skin acts as a barrier and prevents harmful germs, diseases from entering your body. Skin is sensitive to temperature, touch, pressure and pain.

Scientists are experimenting to grow parts of human body, such as ear, skin and heart.

Common Disorders of Some parts of your Body

- Identify common disorders of various parts of body and their causes.
- Suggest ways to keep parts of your body healthy.

Do you know the major disorders of your body parts?

Do you know the causes of these disorders and the ways to keep yourself safe and healthy?

Explore the common disorders in your class, school, family and community. What are the causes of these disorders and illness?

Table 1: Common Disorders and Causes

Body Parts	Common Disorders	Causes
	Asthma is a common breathing disorder. It causes difficulty in breathing due to swollen air passage.	Breathing in polluted air.
	Heart diseases are high blood pressure, hardening of the blood vessels, chest pain, heart attacks, and strokes.	Some common causes are unhealthy diet, lack of exercise, being overweight, stress and smoking.
	Indigestion is the most common problem. Heart burn in another common disorder.	This is caused by too much and too fast eating and also by eating spicy food.

How to keep the body healthy?

Suggest ways to keep parts of your body healthy.

In order to keep our body healthy and all our organs working properly, we must follow some strict rules like:

- Sleeping for 6-8 hours at night.
- Eating healthy food.
- Walking and exercising regularly.
- Breathing in clean environment.

Do you know?
Smoking can cause lungs cancer.

Summary

- Human body is an amazing living thing.
- Human body has many parts such as: teeth, bones, muscles, brain, lung, heart, stomach, skin, eye and ear.
- Each part performs a specific function in the body.
- Skeleton and Muscle support and protect body parts.
- Skeleton and Muscle work together and support your body's movement.
- Teeth are for bitting, chewing, crushing and grinding the food we eat.
- The eyes are for seeing.
- The heart pumps blood to all body parts.
- Stomach store water and food and digest it with the help of the stomach juices.
- Lungs are main breathing organs.
- Brain is the central control system of all body parts.

Review Questions:

1. Checking for vocabulary: Unscramble the words given in column 1 and rewrite them in column 2.

The Human Body Word Scramble

Column No. 1	Column No. 2
EEY	
ETRAH	
GNUL	
OEBN	
EEHTT	
UMLSCE	
OETNSKEL	

2. Circle the Best Response:

i) Digestion begins in one of the following part of the body:

a) In the stomach   b) In the lungs
c) In the mouth   d) In the heart

ii) The largest part of the body:

a) Heart   b) Skin
c) Brain   d) Stomach

iii) The part of the body that protects the internal body parts:

a) Muscles   b) Brain
c) Skin   d) Ear

iv) The part of the body that controls the overall body movements:

a) Heart   b) Brain
c) Muscles   d) Bones

v) The part of the body that gives you shape is :

a) Stomach
b) Skeleton
c) Muscles
d) Skin

3. Write the key functions of the following body parts:

Body parts	Functions
Eye	
Teeth	
Nose	
Muscles	
Skeleton	
Heart	
Lungs	
Stomach	

4. Answer the following questions:

a) Name disorders of teeth, stomach, heart and lungs and suggest some ways to prevent them.

b) Suggest some precautionary measures to athletes and motor cyclists to safeguard their bones while engaging in sports and traveling.

5. Place a Yes for correct statement and No for a wrong statement:

(i) Human body is composed of different parts.

(ii) Brain is protected by skull.

(iii) Cavities can develop in teeth if you brush them properly.

(iv) Ears are the organs of sight.

(v) We have 27 bones in our one hand.

Project:

Model making

Construct a model of body parts that digest food.

What do you need?

- Chart paper
- A box to place your model
- A rubber tubing
- Polythene bags
- A small plastic bottle
- A used light bulb
- A string

What to do?

- First investigate and find diagrams of the human digestive system.
- Critically look at the material and decide which thing can be used to construct which part of the digestive system.
- Construct the digestive system.
- Place it inside a large size box.
- Demonstrate how intestine passes through diaphragm.
- Can you convert this model into a working model?

CHAPTER 2

CHARACTERISTICS AND NEEDS OF LIVING THINGS

Observe living and non-living things in your surroundings. What are the living and non-living things in your surrounding? Observe plants and animals. Have you ever thought of the similarities between animal and plants? Explore, record and share the similarities among a cat, hen, cow, goat, dog, donkey, bird and potted plant. How are they similar and how are they different?

Compare physical characteristics of animals and plants.

In this Chapter you will learn about living things:

- Need of Food, Sunlight, Air and Water for Survival.
- Move and Grow.
- Reproduce and Maintain continuity of life.
- Inherit Characteristics.
- Similarities and differences within a single species.
- Animal life cycle (The Frog; The Butterfly; The Bee).
- Plant life cycle (from Germination of seed to the production of a flower).

All the students will be able to:

- Identify factors necessary for both animals and plants to survive.
- Compare physical characteristics of animals and plants.
- Perform an experiment to show that living things can grow while non-living things cannot grow.
- Explain that many characteristics are inherited from parents.
- Explain the similarities and differences within a single species by giving examples.
- Draw and label the key stages in the life cycle of a plant and an animal.
- Compare the life cycle of two different kinds of animals.
- Conduct a simple experiment to show growth in plants.

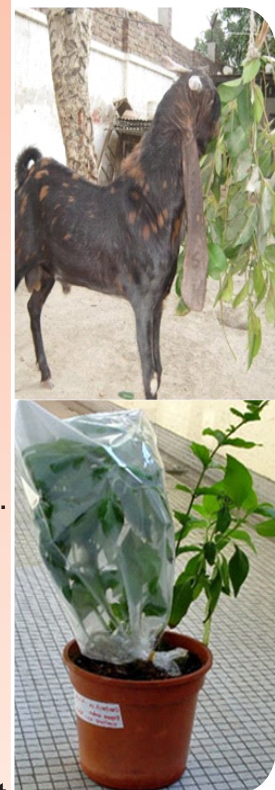



Figure 2.1
Living Things

Factors Necessary for both Animals and Plants to Survive.

Identify factors necessary for both animals and plants to survive.

There are two types of things present on Earth; Living and Non-living.The Living things are divided into two major groups: a) Animals; b) Plants

All living things, plants and animals need sunlight, air, food and water to stay alive. Without these four basic necessities, Living things cannot survive. How do we know if something is a Living or Non-living thing?

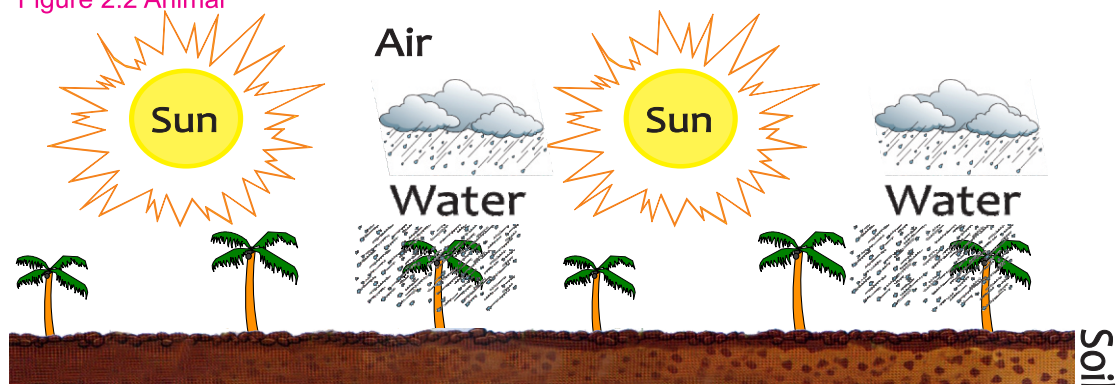



Figure 2.2 Animal

Figure 2.3 Factors Necessary for Survival

We know that all Living things, Plants and Animals, have some characteristics that are not found in Non-living things.

What are these characteristics?

Figure 2.4. Plant

Teacher's Note: The teacher should ask the students to look around in the surrounding and identify the types of things on earth. List the things in two categories on the board. Explain that there are two types of things and these can be grouped as Living and Non-Living things. Ask the students, What does a cat need to live? What does a child need in order to live? Ask the students to talk to their class fellows about the needs, characteristics and differences between living and Non-living things.

Living things Grow:

Perform an experiment to show that Living things can grow while Non-living things cannot grow.

Activity 2.1

What I need?

- A Living Potted Plant
- An Artificial Plastic / Paper / Cloth Plant in a Pot

What to do?

- Place both the plants in the Class near a window / or in the sun.
- Water the plant and observe both the plants for a month.
- Copy the table below into your notebook and write down your observations.
- Talk to a friend and complete the table given below:

Characteristics	A Living Potted Plant	A Plastic / Paper Plant
Is able to move		
Needs Water		
Needs Oxygen		
Needs Food		
Grows as it gets older		
Reproduces itself		
Needs sunlight		
Dies after a certain time period		

How a living plant is different from a non-living plant? Why a plastic plant is a non-living thing? Did the plastic plant grow after a month? What do you conclude from your observation?

Teacher's Note: The teacher should arrange the two types of plants. A real potted plant and an artificial plant. Ask the students to observe the differences. Guide the students to observe and record observations. Place the plants in the classroom or in the school-corridor and ask the students to observe both the plants for a month.

Characteristics of Living Things

Explain that many characteristics are inherited from parents.

All living things reproduce young ones of their own kind. Humans produce children that look like their parents. A hen produces chick and a camel produces calf. Observe the picture given below. How are the young ones similar to their parents? How is a chick different from a baby calf? Observe the resemblance between you and your parents. Do you have a feature in common with your parent? Offsprings resemble their parents because children inherit characteristics from their parents.

Figure 2.5 Living things reproduce young ones.

Plants and animals reproduce in order to maintain the continuity of their life. Do you know that all children inherit certain characteristics from their parents? The characteristics that an organism inherits from its parents are called traits. In humans, traits include such things as the color of hair, skin, eyes, the blood group, the shape of nose and lips.

All Living things (plants and animals) reproduce young ones. Their young ones (children) have some characteristics similar to them. For example, parents with blue eyes will have children with blue eyes, or the seeds of a plant with pink flowers will only produce pink flowers. This transfer of characteristics between parents and offspring is called Inheritance.

Teacher's Note: The teacher could ask the students to compare and share the similarities between the color of their eyes, skin, and hair with their parents. Explain that some traits are inherited from parents by offspring. Guide the students to observe and record observations that are inherited traits in animals and plants.

The species are a particular group of animals or plants that belong together and have some similar quality. They are similar and can produce similar animals or plants.

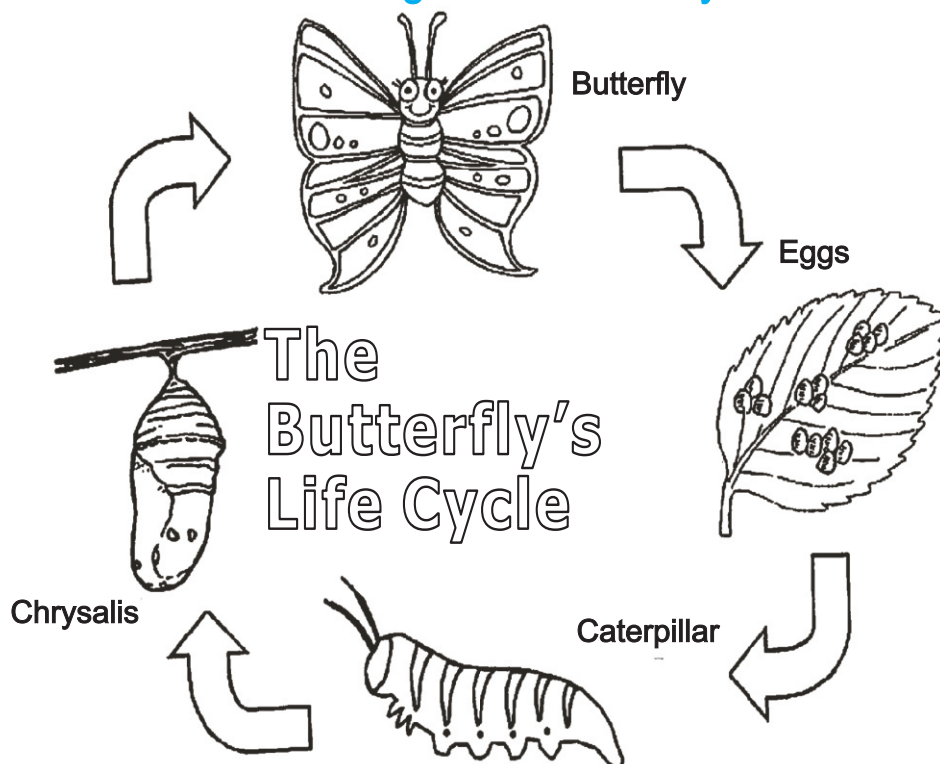
Asia is that region of the world where most animal species face extinction due to the excessive use of land by humans. Also, the tendency of increased use of land for housing and agriculture by humans all over Asia poses a serious threat to many animal species.

Animal Life Cycle

Draw and label key stages in the life cycle of animal.

All living things grow, may it be humans, animals or plants. While growing, all living things go through different changes brought upon by different stages. What are these stages of growth called?

These stages of growth which an animal and plant passes through to reach the adult stage are called the life cycle.

Observe and Colour the stages of the Life Cycle of the Butterfly:

The Life Cycle of the Butterfly:

Compare the life cycle of two different animals.

Do you know that animals also have a life cycle? Observe the life cycle of the butterfly and talk to your friend about different stages:

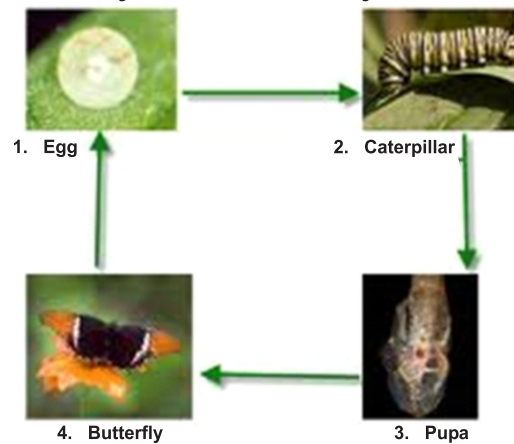



Figure 2.6 Life Cycle of a Butterfly

What are the stages in the life cycle of the butterfly?

Stage 1	Stage 2	Stage 3	Stage 4

Life Cycle of the Frog

Do you know that frogs also have a life cycle? Observe the life cycle of frogs. Make a model showing the life cycle of the Butterfly and Frog.

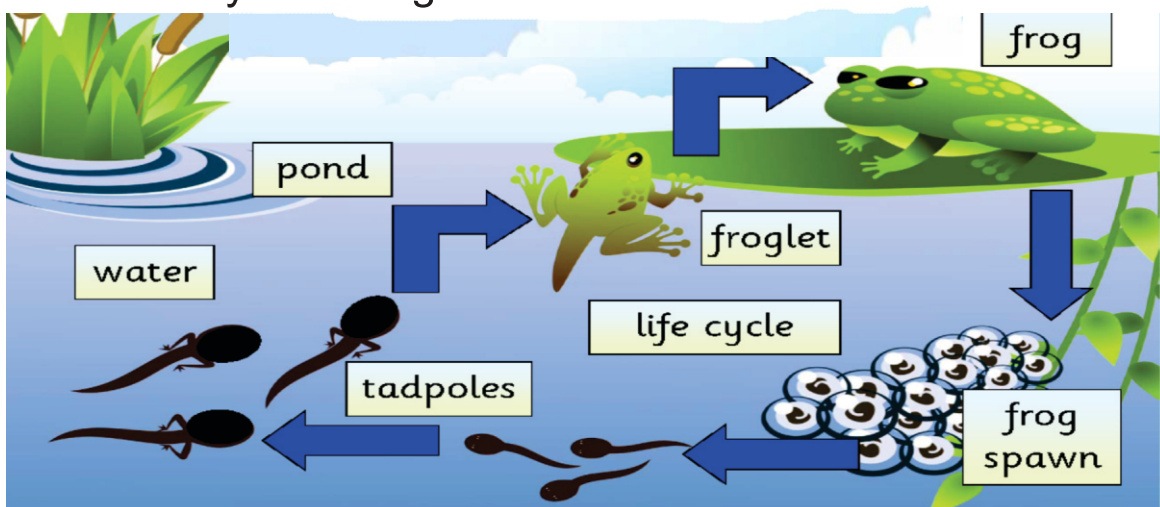



Figure 2.7 The life cycle of the frog

Compare the life cycle of the butterfly with the life cycle of the frog. Work with your friend or group. Write or draw the similarities and differences below:

The Butterfly (Differences)	Similarities between Frog and Butterfly	The Frog (Differences)

Now observe the Life cycle of the Bee, as given below:

How is it similar to the life cycle of frog and butterfly?

What is the difference between the life cycle of the bee and the frog? Talk to a friend:

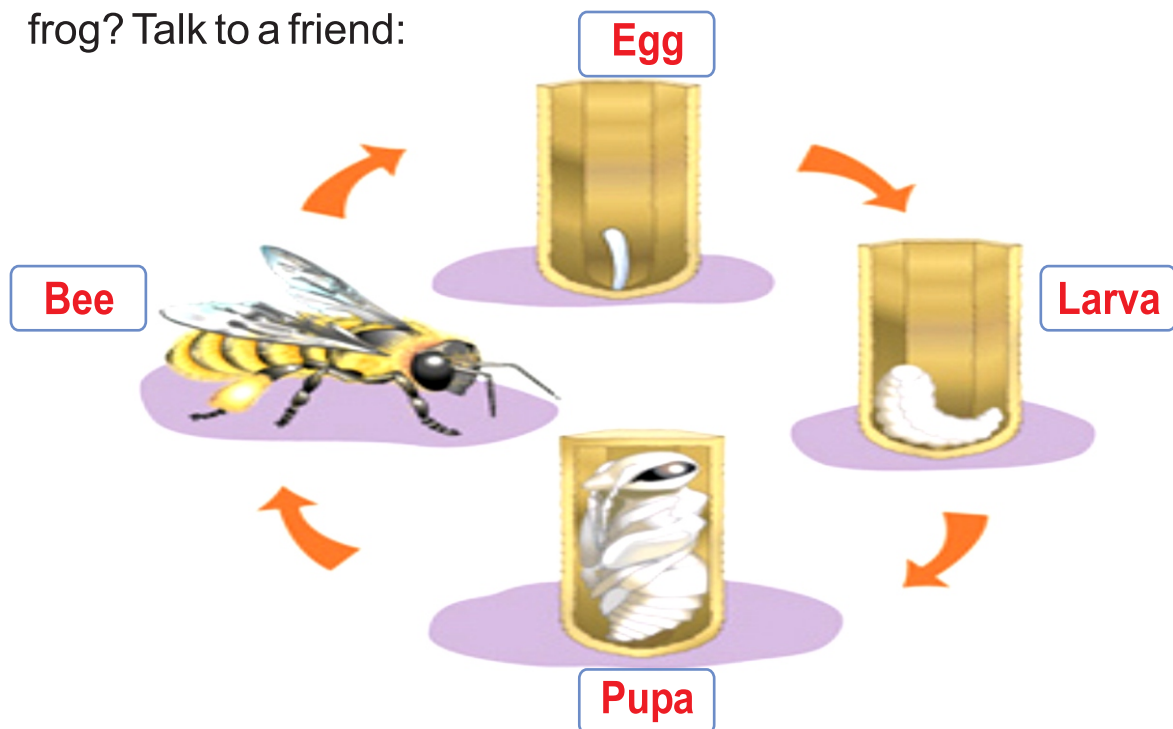



Figure 2.8 Life Cycle of the Bee

Compare the life cycle of bee with frog. Write the similarities and differences in the table given below:

The Bee	Similarities between the Frog and Bee	The Frog (Differences)

The Plant's Life Cycle

Draw and label key stages in the life cycle of the plant.

Do you know that plants also have a life cycle? Observe the life cycle of a bean plant.

Life cycle of a green bean plant

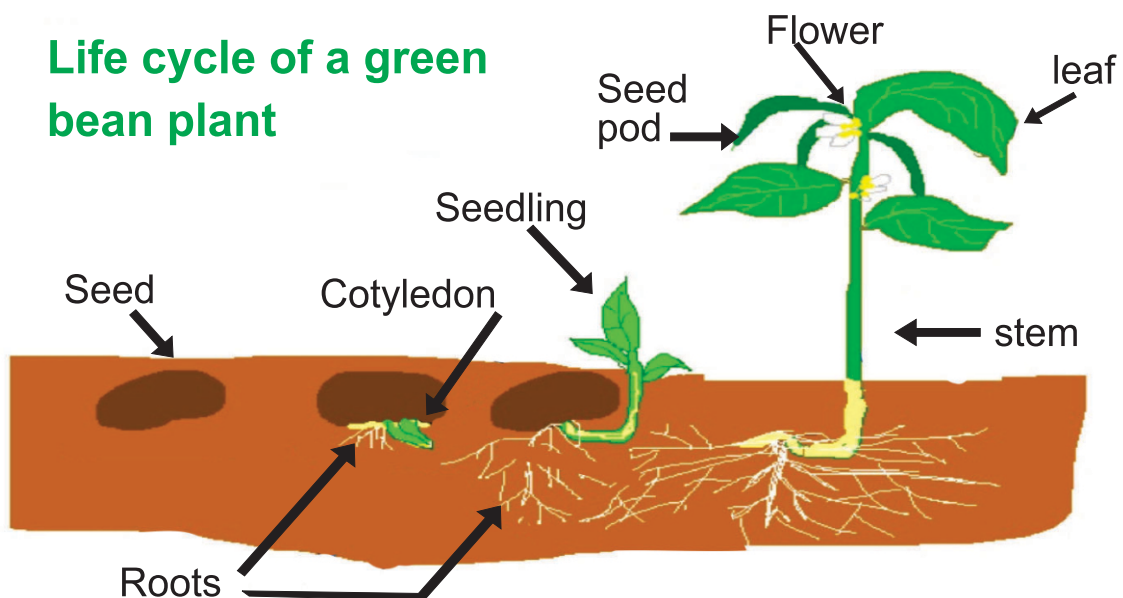



Figure 2.9 Life Cycle of a Bean Plant

What are the stages in the life cycle of a green bean plant? Observer, number the stages, and label them:

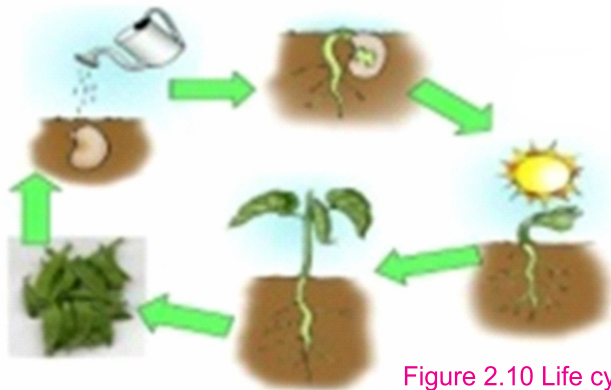



Figure 2.10 Life cycle of a bean plant

Conduct a simple experiment to show growth in plants.

Growth in Plants

What do you need?

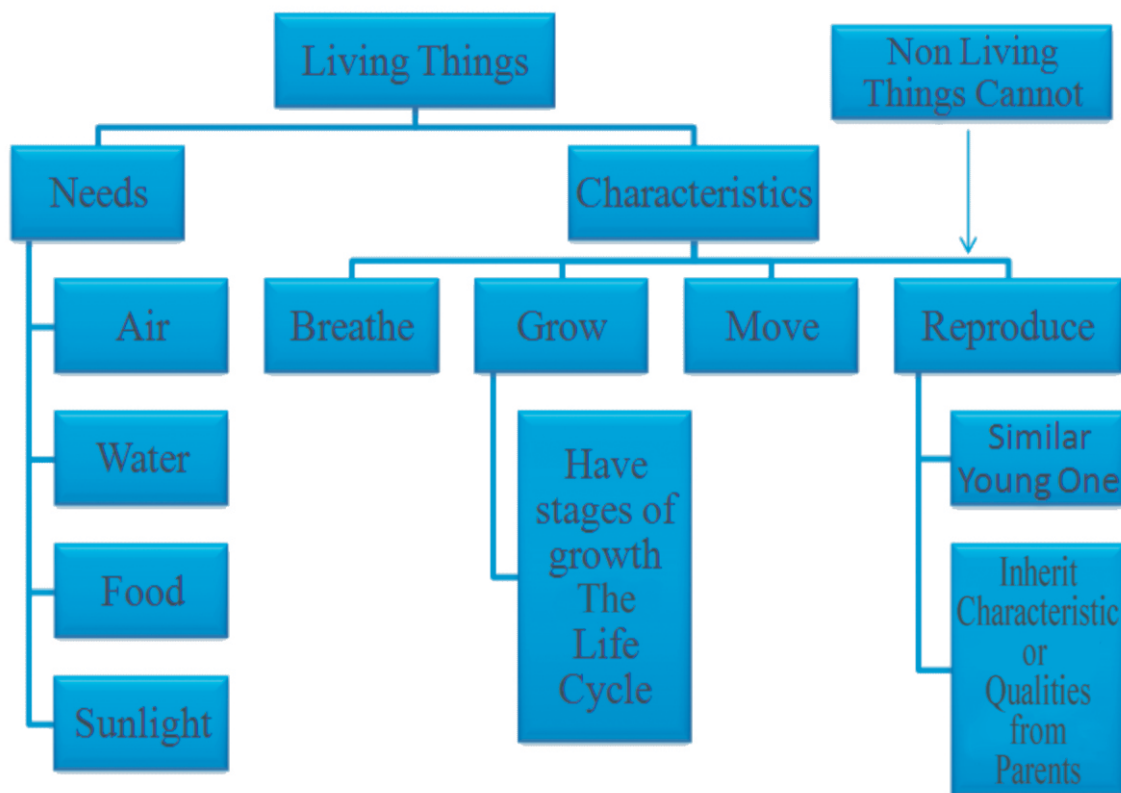
- Seeds of plants (sunflower or corn or bean or gram, whichever is available easily)
- A pit in the ground having soil or a pot, an empty jar and some organic manure
- Water

What to do?

1. Take seeds of the plant you would like to grow and put them in a pit in the ground/soil in a pot.
2. Cover the seeds with soil and fertilizer. Water them regularly.
3. Observe them daily. Soon you will observe a young plant coming out of the soil.
4. You will observe a stem and few leaves emerging from the stem.
5. You can take out plants of same seed at different time intervals and find stages of the plant's life cycle.
6. Copy the table in your notebook. Draw different stages in the table.

Teacher's Note: The teacher could make pair or group of students.
The teacher could ask students to soak bean seed and germinate bean seed in a jar. Observe, draw and present the stages in the life cycle of a bean plant.

Time	Stages of life cycle of plant
Seed after 3 days of sowing	
Seed after 7 days	
Seed after two weeks	
Seed after one month	

Summary

Review Questions:

1. Circle T for True and F for False:

(i)	Non-living things can grow.	T	F
(ii)	Living things need Air.	T	F
(iii)	In the life cycle of plant, the leaves grow first.	T	F
(iv)	A baby elephant inherits all qualities from the mother elephant.	T	F

2. Compare the two parrots given below or at home. How are they similar and different? Write their similarities and differences:

Parrot 1

Parrot 2

Parrot 1	Similarities	Parrot 2

3. Use the words to label the life cycle of the plant.

The Life Cycle of a Bean Plant:

Life Cycle

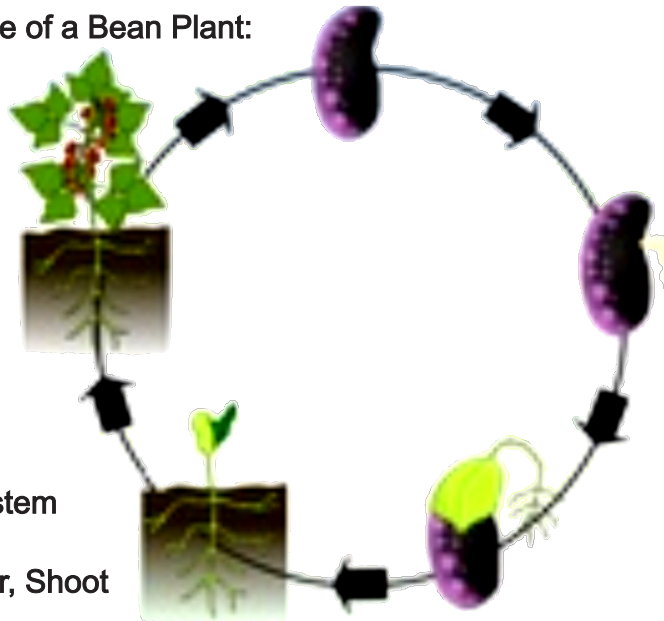
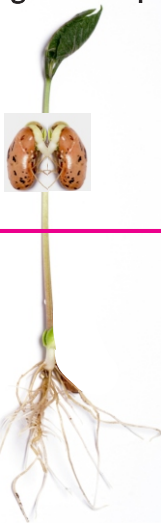
Grow

Growth

Bean

Soil

Germinate, stem

Roots, Flower, Shoot

4. Group Activity: Sequencing the cards of a germinating seed.

What do you need?

- Photocopy the stages, paste on cards or draw the stages on a card.
- One set per group.

What to do?

- Work with your friend or group members.
- Arrange these cards in order.

A sprouting Bean Sequencing Card	A sprouting Bean Sequencing Card
A sprouting Bean Sequencing Card	A sprouting Bean Sequencing Card

Project:

Activity

Investigating the Life Cycle of Butterfly

What do you need?

- An empty glass or plastic bottle with small holes in its lid.
- Larva (You can easily get it from a Pea legume).
- Fresh leaves.

What to do?

- Place larva and fresh leaves in a bottle, cover it with a lid having holes in it and place it in an airy place.
- Put fresh leaves daily in the bottle and observe it.
- Note the changes in the larva and draw them.
- What changes did you observe? Compare your observations with the pictures of the life cycle of butterflies given in the chapter.
- Discuss the reasons of having holes in the lid and changing fresh leaves daily and why they are necessary.
- How do you feel when you observed a butterfly coming out of your jar? How many days did the larva take to become a butterfly?

CHAPTER 3

FOOD AND HEALTH

As we have studied earlier that all living things need food in order to live. Food gives us energy and nutritional substances for our growth and health. Have you ever thought why you eat different kinds of food (Fruits, Vegetable, Chicken, Roti, etc.) for lunch and dinner? Why you cannot stay healthy eating only one food group? Observe the picture below. Do you eat food from each of the food groups?

In this chapter you will learn about:

- The source of different food groups (Fruits, Vegetables, Meat, Pulses and Cereals).
- Main groups of food (Carbohydrates, Proteins, Minerals, Vitamins and Fats) and their properties.
- Balanced diet and its importance.
- The basic Principles of Hygiene and Exercise.

All the students will be able to:

- Identify the sources of common food.
- Explain the properties of major food groups.
- Classify different types of food items into their basic groups.
- Interpret a food pyramid in order to show the relative importance of various food groups.
- Differentiate between balanced and unbalanced diet.
- Suggest a balanced meal from the given list of foods and give reasons to explain why each type of food was chosen.
- Explain the effects of unbalanced diet on health.
- Explain hygiene and its basic principles.

Which food group is this?
Which nutrients do you get from this food group?

Food groups and their sources

Identify the sources of common food.

Unscramble the given Word boyhteardrac

Hint: Name of a Food Group.

Do you know the various sources of food?

What do you eat for breakfast? What food do you have for dinner?

What are the sources of these food items?

Look at the sources of food and identify the food groups.

How would you classify these into food groups? What are the sources of the food?

You must have noticed that most of these foods come from plants or animals.

Figure 3.1 Food Groups

Teacher's Note: The Teacher should ask the students to observe the pictures and discuss what different types of food items do they eat and why? What are the sources of these foods items?

Main Groups of Food and their properties

- Classify different food items into their basic groups.
- Explain the properties of major food groups.

Why do we need to eat different types of food? It is because each type of food is from a different group, and these groups have substances present in them that are important for maintaining our health and growth. Do you know the major food groups and their properties?

They are: Carbohydrates, Proteins, Fats, Minerals and Vitamins. In order to function properly, our body needs each of these substances in sufficient quantity.

Do you know their properties?

Let us learn about the four (4) major food groups and their properties:

Figure 3.2 (a) Major food groups

Figure 3.2 (b) Major food group

Meat, Milk, Eggs, Pulses provide us Protein. They are called body building foods. They help our body grow and repair tissues and muscles.

Fats are found in Oil, Butter, and Margarine. Fats are also found in seeds and nuts. Foods in this group also give us energy and warmth. Fat provides twice as much energy as the same amount of carbohydrate.

Figure 3.2 (c) Food group

Animals such as the Blue Whale have a thick layer of fat under their skin which protects them from the cold temperatures of the sea.

Teacher's Note: The teacher should ask the students to observe the pictures and discuss the sources of food with their class fellows. They should also read and share the properties of the said food group.

Vitamins

Vitamins are an important food group that do not provide energy but are required nevertheless for the proper functioning of the body. Our body needs a sufficient amount of Vitamins for its proper functioning.

Vitamin	Sources	Function
A	Carrots, Cod-liver oil, etc.	Prevents night blindness
B complex	Vegetables, Whole wheat grains, Fresh meat, etc.	Prevents various skin diseases, keeps the nervous system healthy and prevents Beriberi; a disease which drains energy
C	Oranges, Guava, Lemons, mainly Citrus fruits and vegetables.	Strengthens the Immune system and prevents a disease called Scurvy; which causes swollen and bleeding gums.
D	Milk, Cod liver oil, Sunlight, etc.	Strengthens Bones and Teeth, and prevents a disease called Rickets; which causes bones to become soft and weak.
K	Fresh fruits and vegetables.	Increases or assists the production of Platelets; which clot blood.

Table 3.1 Importance of Vitamins.

Do you know that the body also requires fibers for health?

Dietary fiber, found mainly in fruits, vegetables, whole grains and legumes, is probably best known for its ability to prevent or relieve constipation. But foods containing fiber can provide other health benefits as well, such as helping the body to maintain a healthy weight and lowering your risk of diabetes and heart disease.

Minerals

Minerals are also an important food group that do not provide energy but are required for body's growth and keeping us healthy. Our body needs twenty one essential minerals such as calcium, iron, sodium, chlorine, phosphorous and potassium in large quantities. Also, some minerals such as Iodine, Zinc and Magnesium are required in tiny amounts for growth and body functions. The sources and functions of two important minerals are given in Table 3.2:

Minerals	Sources	Functions
Iron	Liver, Dark green vegetable, red meat, flour, egg yolk, dried fruit, nuts, dried beans, peas, raisins, poultry, fish, etc.	Iron makes red blood cells. Iron is involved in oxygen transport and storage for energy conversions. Deficiency causes Anaemia.
Calcium	Milk, Cheese, Egg, dark green vegetables, small fish and its bones, etc.	Essential for building bones and teeth, muscle functioning and blood clotting. Deficiency causes Rickets.
Copper	Whole Wheat, Bananas, Peas, Prunes, Oysters, Liver, Kidney, Grains and Legumes	Copper builds red blood cells. It is also involved in the building of bones. Deficiency can cause anaemia, starvation and kidney problem.

Minerals	Sources	Functions
Magnesium	Nuts, Seeds, Dried figs, Dried Apricots, Almond Seeds, Corn, Vegetables and Fruits, etc.	Magnesium plays a role in developing bones and in metabolic processes. Deficiency can cause painful joints, osteoporosis, memory loss and diabetes.
Sodium	Meats, eggs, table salt, fruits and vegetables	Sodium plays an important role in the distribution of water in the body. Deficiency of Sodium causes imbalances in fluid volume in the vessels and tissues.
Iodine	Meat, onion, eggs, iodized salt and seafood	Iodine is involved in formation of a hormone that is required to produce energy. Deficiency of iodine in children may cause mental retardation.

Table 3.2 Importance of Minerals.

Every third child in Pakistan has a deficiency of Iron.

Teacher's Note: The teacher should ask the students to identify the major minerals in their diet for a week and share their findings with their class fellows, regarding the essential minerals that were included in their diet and the minerals that were not included in their diet.

Balanced Diet and its importance

- Interpret a food pyramid to show the relative importance of various food groups.

Do you eat food? That is right. You do eat food. If a living thing does not eat food, it will die. But have you ever thought about the food you eat. What type of food you eat? What is the quantity of each type of food group in your diet? What effect does that type of food have on your body? The food pyramid helps you choose and eat the correct amount of each food group. The food pyramid is a chart that illustrates the major food groups that are carbohydrates, proteins, fats, minerals and vitamins. The food pyramid also explains what a person should eat and in how much quantity to keep the body healthy.

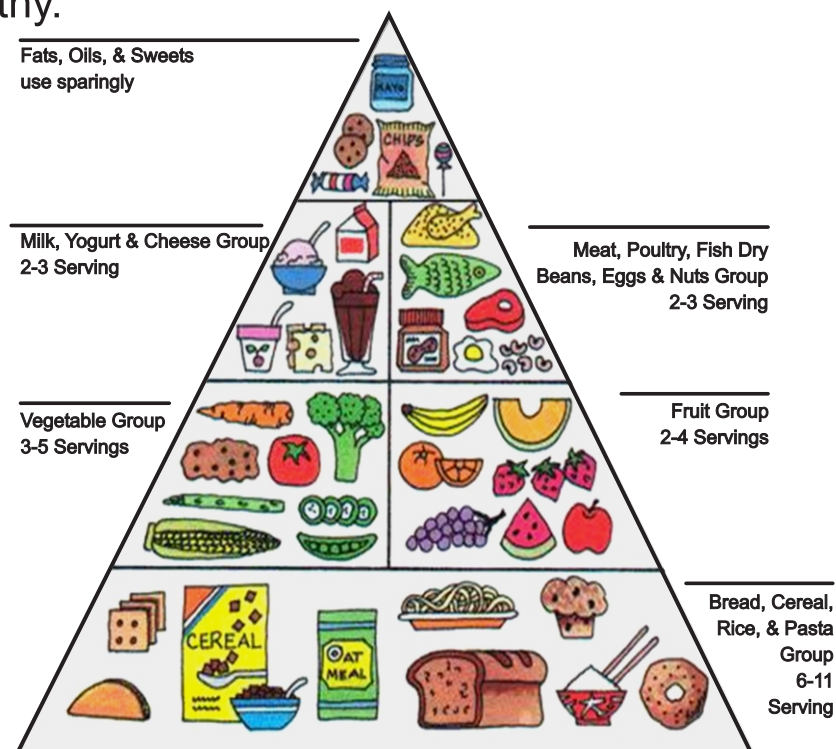



Figure 3.3 Food pyramid

You should eat more food from the bottom of the pyramid than from the top.

Interpreting the Food Pyramid

Study the Food Pyramid.

Name the Groups of Food in the Pyramid.

____

____

____

Which food group should you include in your diet?

____

Which food group should you eat most?

____

Which group should you eat the least?

____

Balanced and Un Balanced Diet:

- Differentiate between balanced and unbalanced diet.
- Suggest a balanced meal from the given list of foods and give reasons to explain why each food item was chosen.

Why do we need to eat different types of food? It is because each food is from a different food group, and these groups or substances present in the food have different effect on our body. They are: Carbohydrates, Proteins, Fats, Minerals and Vitamins. In order to function properly, our body needs each of these substances in sufficient quantity.

Why is there a need to eat food items from all the food groups? What would happen if we would eat more from a food group and less from another?

We have studied different types of foods and how they effect the body differently.

Some foods like meat, egg, pulses provide protein to the body in order to help it in growth and repair.

Fruits and vegetables provide us vitamins and minerals for growth and functioning of the body.

Grains and cereals provide carbohydrate to the body for energy.

Butter and oils provide fat for good quantity of energy to the body.

In order to stay healthy and grow well, we need to eat right amount of different foods from all food groups. When you eat foods to provide you enough of all nutrients every day, you are eating a Balanced Diet. How do you know that you are taking the right amount of food from each food groups? You can use the Food Pyramid, on the previous page, to get guidance about the amount of foods you need to eat in order to keep yourself healthy.

Activity 3.1

Selecting food for Protein Requirements

What do you need?

Given below is a table of protein contents of some familiar food types.

Food	Protein Content/g/100g
Whole Milk (Cows)	3.2
Beef	20.2
Chicken	17.6
Fish	17.4
Red Kidney Beans (dry)	22.1
Peanuts	25.5
Eggs	12.3
Apples	0.4
Potatoes	2.1

What to do?

A healthy child, 7-14 years of age, required approximately 1 gram of protein per kilogram of body weight. What is your body weight? Calculate your protein need in grams of protein per day. Look at this chart and select your diet fulfilling your protein requirement per day. Draw a plate with your selected food items. Also mention the amount you have selected.

Marasmus disease is caused due to severe protein deficiency and it affects infants and young children. They become dehydrated and this eventually results in weight loss.

Marasmus develops due to starvation and lack of nutrients. The patients become bony with very scarce muscle tissue. Do you know that Kwashiorkor is also a kind of protein deficiency disease? If your diet has more carbs such as rice, potato, yams and bananas as compared to protein you may end up contracting this disease. This affects older children. Such people appear puffy in the abdomen area and this is due to fluid retention. The symptoms are fatigue, diarrhea, irritability, impairment of mental health and stunted growth.

- Explain the effects of unbalanced diet on health.

For having good health, a balanced diet is needed. It is important to eat food from all food groups in order to keep yourself healthy. If you start eating only one or two groups of food then your diet will lack in other nutrients. This will leave you with deficiencies and you will eventually fall ill. Therefore, for good health balanced diet, exercise and maintaining hygienic conditions is very important. If you are eating all the required basic components of food, minerals and vitamins in the proper ratio, then you are eating a balanced diet. In addition to this, drinking adequate amount of clean, fresh and boiled water is also important for your health.

Teacher's Note: The teacher should help the students in identifying the food items that contain proteins. They should explain to them the importance of protein in growth.

Activity 3.2

Suggesting a Balanced Meal to some one

What do you need?

List/Pictures of Food Items:

Cereal, Roti, Bread, fried fish, chicken curry, chicken roast, French fries, soft drink, milk, soup, bread, apple, fresh salad, leaves cucumber, meat and pulses/daal.

What to do?

Make a List. Draw a balanced meal from the above list of foods. Share your list with your friend and group in class and your parent. Talk to your class fellows: Why do we need to eat a balanced diet? Why did you select a particular food items?

Healthy Eating Habits:

- Make sure your diet comprises enough fibre, pulses, whole grains, fresh fruits and vegetables.
- Keep the consumption of oils and sweets to a minimum.
- Control your salt intake. Too much salt can lead to high blood pressure.
- Eat freshly prepared food.
- Stop taking soft drinks and beverages and increase the intake of water, juices and soups.
- Eat smaller portions throughout the day instead of three big meals.
- Drink plenty of water and fluids. Always keep your body hydrated.

And if you don't follow these guidelines and don't eat a Balanced Diet, then your body starts to suffer and you get sick. In order to function properly, your body needs certain quantities of food from all food groups and if you eat an unbalanced Diet, your body will contract diseases, due to deficiencies and also malnutrition.

Teacher's Note: The teacher needs to develop a list of food items found in the local context for the Balanced Diet activity. Students should be advised to share their lists and learn about Food and Balanced Diet at home and with close family members in order to create awareness about the said topic.

Personal Hygiene and its basic principles

- Explain Hygiene and its basic principles.

What are some ways to Practice Hygiene?
Practice these to stay healthy. Tell your younger siblings and family members.

Figure 3.4 Washing hands

Do you know that harmful germs are everywhere in our surrounding? You need to wash your hands with soap and water before and after eating in order to prevent the spreading of a number of common diseases caused by the harmful germs.

Do you know that cleaning your teeth before going to bed at night and also before eating in the morning can help in preventation of tooth problem and ache? After eating anything, you should also rinse your mouth and make sure that no food particle is stuck between your teeth so as to prevent possible tooth and gum decay.

Figure 3.5 Brushing teeth

Figure 3.6 Taking bath

Do you know how to keep your body neat? You need to clean your body by taking a bath every day.

Figure 3.7 Trimming nails

Do you know how to protect yourself from germs? You need to trim your nails in order to protect yourself from germs.

Figure 3.8 Brushing hair

Figure 3.9 Washing feet

Do you know that you need to comb and brush your hair daily?

Do you know that you need to wash your feet in order to protect them from germs?

Figure 3.10 Washing clothes

Do you know that you need to wear clean, washed clothes to school and at home everyday?

Teacher's Note: The students should be asked to share these healthy tips with friends and family. Meanwhile, the teacher should demonstrate the correct method of brushing teeth and washing hands.

Basic Exercises:

Daily Exercises, physical activity and eating a balanced diet are simple ways to make you healthier.

Figure 3.11 (a)

Healthy habits help you to :

- Do better and concentrate on studies in school.
- Grow and develop a strong body and bones.
- Feel good about yourself.
- Lower your risk of contracting diseases in future like obesity, diabetes, heart disease, stress and certain types of cancers.

Figure 3.11 (b)

Exercise Basics:

You need to do 60 minutes (1 hour) or more of physical activity daily. You could do different kinds of exercise each day. For example, each day, you could do 35 minutes of running around a playground, 10 minutes of monkey bars climbing, / push-ups, and 15 minutes of jumping rope/ bicycling to reach 60 minutes.

Figure 3.11 (c) Basic exercises

Group Activities:

You could participate in physical activity with your friends and family members. Try one of these ideas:

- Go for walk with a friend or your parents.
- Hike or swim on the weekends as a family.
- Try gymnastics, aerobics, or yoga classes.
- Join a scouts club and community sports program, cricket, football or hockey.

Summary

Food Sources and Groups	What it does for the body	Examples
Grains also called cereals provide you Carbohydrates.	Major source of quick energy for your body.	Sugar, Wheat, Bread, Pasta, etc.
Meat gives you Proteins.	Proteins are body building foods. They help our body grow and repair tissues and muscles.	Meat, Milk, Eggs, Peas, etc.
Fats and oil provide you energy.	Foods in this group also give you energy and warmth.	Oil, Butter, Margarine, etc.
Fruits and vegetables give you Vitamins and Minerals.	Foods in this group help your body fight against diseases and keep you healthy and fit. Minerals also help in growth.	Milk, Meat, Fish, Oranges, Salt, Cheese, Fresh and Dry Fruits, spinach, etc.

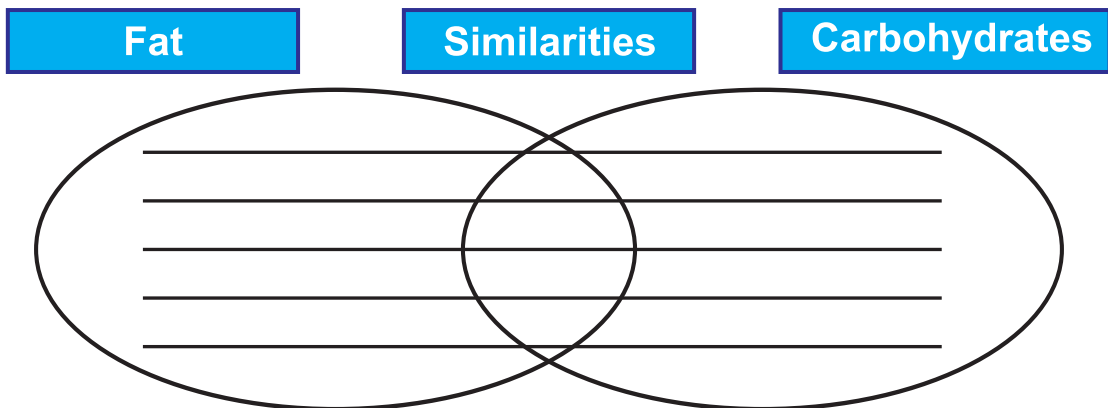
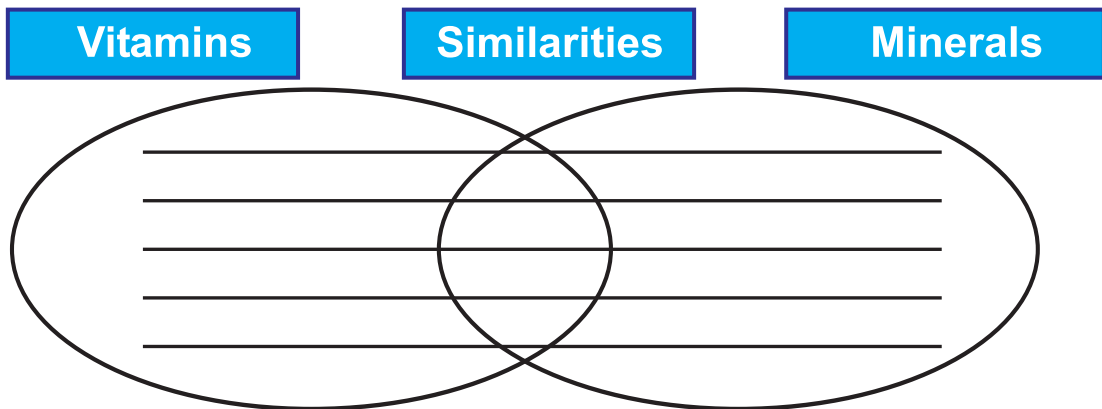
Review Questions:

1. Circle T for True and F for False Statements:

a) A balanced diet includes food from three food groups. T F
b) A ruptured skin requires protein rich food for its repair. T F
c) In winter, half portion of our daily diet should comprise Fat. T F
d) Vitamins do not provide energy but are important for health. T F
e) A Food Pyramid Chart helps one in choose suitable food daily. T F

2. Give answers for the following questions.

(i) What are the main sources of protein?

(ii) What is similar and different in Fats and Carbohydrates?

(iii) What is similar and different in Vitamins and Minerals?

(iv) A food pyramid helps one to prepare a balanced diet plan. Give three reasons:

(v) Give three effects of eating unbalanced diet on health:

Project:

Preparing a Balanced Diet Plan for My Family

You have to prepare a Balanced Diet Plan for three days. Talk to your class fellows and elder brother/ sister and parents.

Create a healthy Diet plan that follows these rules:

1. Each day, the diet plan includes options from three (or more) food groups.
2. Over the entire three days, the diet plan includes at least one food item from each of the food groups.
3. See the Food Pyramid for ideas on healthy diet food item. You may also talk to your friend, teacher, elder brother/sister and family members.

Food Group	Day 1	Day 2	Day 3
Grains			
Fruits			
Vegetable			
Dairy			
Meat, Fish, Egg, Pulses			
Drinks			

Activity Questions:

1) What sources of food did you include in the plan?

____

2) Which source do you eat the most?

____

3) Which source do you eat the least?

____

LIVING THINGS AND THEIR ENVIRONMENT

Have you ever thought of the things that are in your surroundings? What are the different things in the water (pond, lake, sea, and river) environment? What is in the soil? What is in the desert? Have you ever thought how the animals and plants survive in the deserts and the sea environment? What are the differences in these animals and plants that enable them to survive in these environments?

In this chapter you will learn about:

- Environment and its living and non-living components.
- Types of Environment (Land, Water and Air).
- Classification of Animals according to their Eating Habits.
- Introduction to Simple Food Chain (Producers, Consumers and Decomposers).

All the students will be able to:

- Define the environment.
- Explain components of environment with examples.
- Differentiate between various types of environment.
- Explain the characteristics of animals and plants which enable them to survive in a particular environment.
- Classify animals on the basis of the food they eat.
- Differentiate among carnivores, herbivores and omnivores with the help of examples.
- Define producers, consumers and de-composers.
- Explain the importance of producers, consumers and de-composers in the food chain.
- Make a simple food chain to show the relationship among producers, consumers and decomposers.

Figure 4.1 Exploring the Environment

The Living and Non-living components

Activity 4.1:

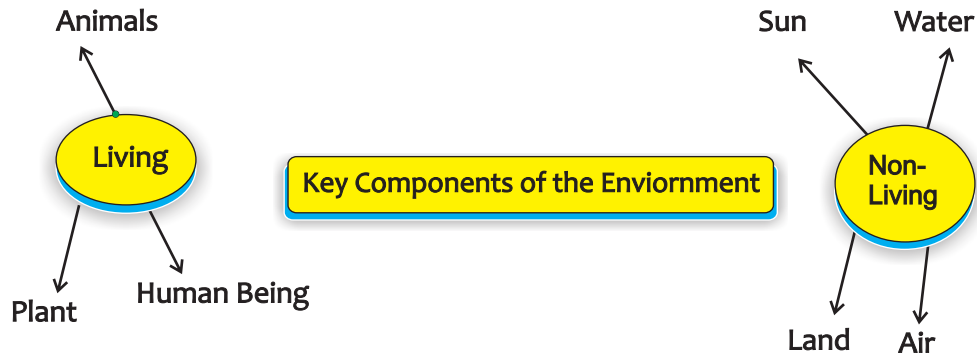
Comparing Environments and Components

- Define the environment.
- Explain components of environment with examples.

Look at the pictures and name the types of Environment. Make a list of the living and non-living components of the Environment. How are the environments similar and different?

Figure 4.2 Different Types of Environment

The (Land, Water and Air) Environment in the above pictures have many living and non-living things. The living things in these environments have different characteristics that make their survival possible in these different environment. These things depend on other non-living things and living things for their survival. These things are called components of environment. The human beings are the key component of the environment and also depend on other plants, animals, fellow human beings for their survival. All living things also depend on the non-living components of the environment for their survival. Which non-living components do living things depend on for their survival?

The environment is one's surrounding and all living and non-living things in that surrounding. The Key Components of the Environments are as follows:

Types of Environment (Land, Water and Air)

Various types of Environment

- Differentiate between various types of environment

We have various types of environments in Pakistan and all these environments have some unique features. Pakistan is blessed with all types of Land, Water and Air Environments, such as Grasslands, Wetlands, Forests, Lakes, River, Sea, Ocean, Deserts, Valleys and Urban and Rural Environments. We need to know the key components of these environments. We need to protect the environment and its key components for the survival of living things and human begins. Let us study the various types of environment.

Figure 4.3 Desert

Deserts are very hot, dry and sandy place. As the picture shows that deserts have extreme heat and dryness and very little rain throughout the year. Deserts are very hot during the day time and the temperature drops sharply during the night.

Figure 4.4 Lake

Lake, pond, river, sea and ocean are water bodies. Lake and pond are small fresh water bodies that are mostly slow, as you can observe the calm waters of Keenjhar Lake in Thatta Sindh. Rivers are relatively big and flow faster. The sea and ocean are mostly salt water, large, deep and fast flowing water bodies. We have the Indus River and Arabian Sea.

We need to keep our lakes clean as these are also the habitat for the deadly dengue Mosquitoes.
We could destroy the Dengue Mosquito by introducing a special Mosquito Eating Fish in the water bodies.

Figure 4.5 Forest

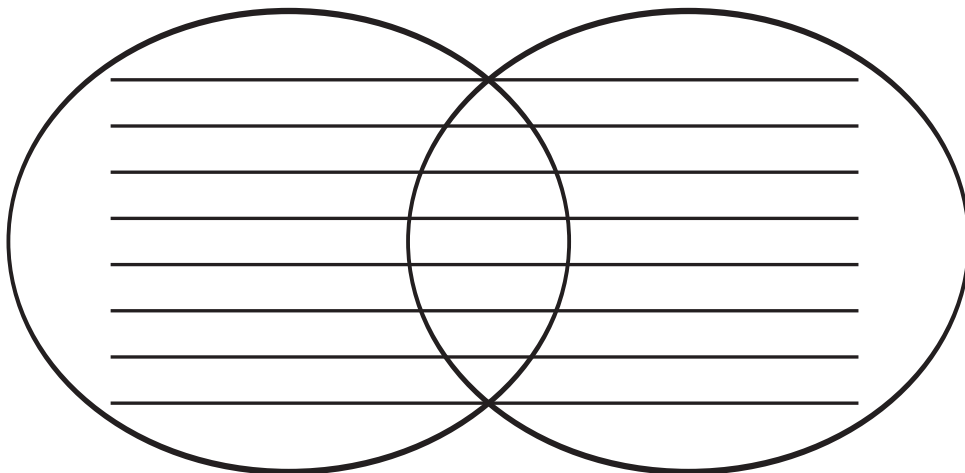
The Forest has many, many trees and a combination of herbs shrubs, plants, seedlings, and several varieties of birds, mammals, insects, reptiles, amphibians, and small creatures. Which Forests do we have in Pakistan?

The urban environment that includes cities and towns but not rural areas and villages are thickly populated and developed areas.

Figure 4.6: Urban Environment

Grasslands are lands with grasses and not large shrubs or trees. The grasslands are dry areas with little rainfall.

Figure 4.7 Grassland

Compare any two environments of your choice. How are the environments similar and different? Write their similarities and differences below:

Activity 4.2

Recording the Characteristics of Animals and Plants in Different Environments.

- Explain the characteristics of animals and plants, which enable them to survive in a particular environment.

Figure 4.8 Observing a Turtle

What I need?

- Observe your surroundings.
- Talk to your pair, family members, elders, teachers, and senior fellows.
- Visit a library, visit the WWF website or WWF Center in Karachi.
- Watch a TV Documentary.
- Dig a flower pot/school garden.

Figure 4.9 Guided Observation of Plants

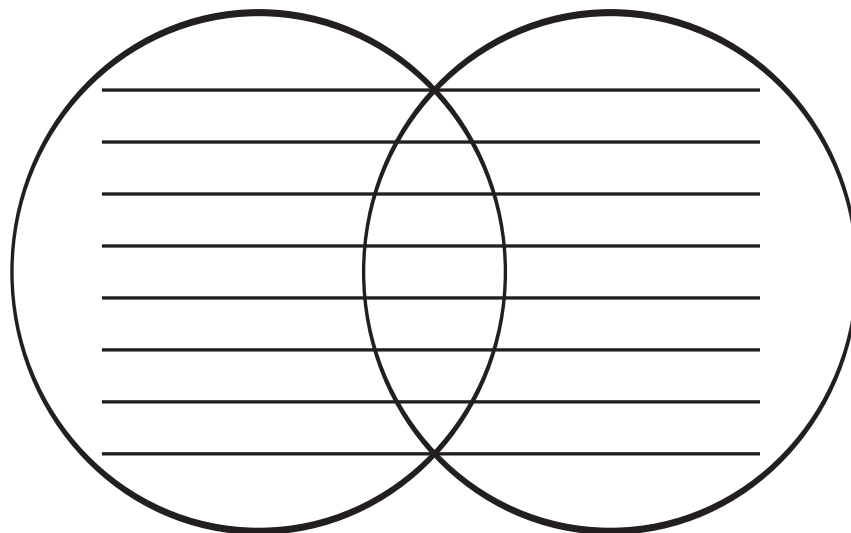
What to do?

1. Your teacher will form groups of four or five students in a team.
2. Ask each member to observe and record characteristics of one animal and one plant from his or her surroundings.
3. Draw or bring a picture of the animal or plant that was observed.
4. Along with your teacher, dig a flower pot/school garden and observe the animals and their characteristics in the pot/garden.
5. Now share the name/picture of the animals and plants, along with their characteristics, with the group members.

What I observed?

(Remember to write your team members' names)

Team Members	Name/Picture of Animal and Plant	Characteristics of Animal and Plant

How are the characteristics of the animals and plants similar and different? Write their similarities and differences.

Teacher's Note: The teacher needs to discuss with the students and assist them in identifying similarities and differences in animals and plants. Also, bring original pictures of animals and plants for observation.

Activity Questions:

1. Which characteristics were the most interesting and unique?
2. Where did you find the characteristics of animal? What was the source?
3. Whom did you consult? What did you read?
4. What characteristics were most common in animals and plants?
5. Where can you find different animals and plants?

The Deserts are dry and hot place. Desert animals and plants have special hard skin covering which protects them from the heat and loss of water in the dryness. The plants have prickly / needle like leaves to avoid water loss. The camel in the deserts can survive without water for several days. The camel has a special water storage space in its hump.

The Grasslands are also dry places and mostly have grasses, small flowering plants and few trees. These are homes to a variety of mammals, birds, reptiles and insects. The animals in these grasslands are mostly small in size, and have skin colour like the grasses in the grass lands which protect them from enemies. They have broad feet for fast escape.

In Pakistan, some mountain grassland animals are Chiltan Markhor, Sindh Ibex, Ladahk Urial, Brown Bear, Grey Wolf, Asiatic black bear, and leopard and carnivores such as two species of fox and striped hyena and Asiatic jackal.

The flare horned markhor, sarmantier, hyena, wolf, and leopard are also threatened in this ecoregion, by predators and hunters. The presence of more than 150 bird species has been recorded in this region.

Classification of Animals According to Eating Habits

- Classify animals on the basis of the food they eat.
- Differentiate among carnivores, herbivores and omnivores with the help of examples.
- Define producers, consumers and decomposers.

Animals in these environments eat different types of food items. On the basis of food type, animals can be classified into three kinds.

- Herbivores that eat only plants.
- Carnivores that eat only animals.
- Omnivores that eat both animals and plants.

Observe the picture and identify Herbivores, Carnivores and Omnivores.

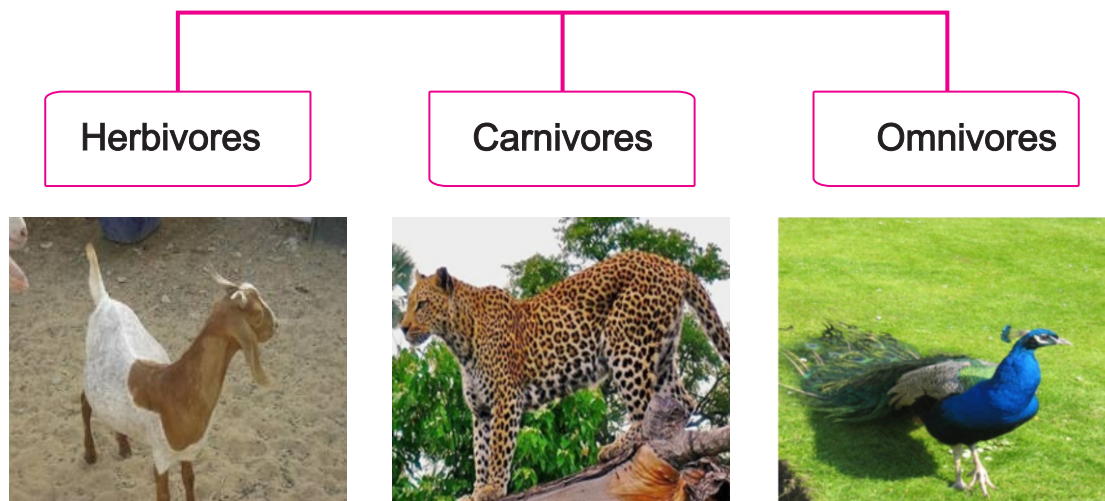



Figure 4.10 Animals and their eating habits

All living things in the environment are placed in three categories according to their place in the Food Chain/Food Web. Are you aware of these categories? What is your place in these categories? These categories are producers, consumer and decomposers. Who are you? Are you a Producer? Are you a Consumer? Are you a Decomposer?

The sun is an important element in the food chain/food web as it provides the sunlight energy to the producers, the plants to produce food. In the absence of sunlight, the entire food chain would become inactive and collapse.

- Explain the importance of producers, consumers and decomposers in the food chain.
- Make a simple food chain to show the relationship among producers, consumers and decomposers.

Figure 4.11 Plants are Producers

Food chain and food web show the relationship and multiple linkages among the various producers, consumers and decomposers in a food web. These linkages are based on the source of energy and food. The sun plays an important role in this food web as a key source of energy.

Plants are at the beginning of the Food chain and Food Web. Plants are Producers. Energy comes from the Sun and plants make food from this energy.

Herbivores are primary consumers and eat plants, vegetables and fruit. For example, sheep and birds are primary consumers and eat plants and plant products.

Figure 4.12 Birds and Sheep are Primary Consumers

Figure 4.13 Consumer and Decomposer

Carnivores are secondary consumers and eat primary consumers. For example, the cat is a secondary consumer that eats birds / mouse (primary consumers).

There are a tertiary (third level) of consumers in the Food Web. The tertiary consumers eat the primary and the secondary consumers. A wolf is a tertiary consumer that eats the mouse, the primary consumer, and the cat the secondary consumer.

Omnivores are consumers that eat both producers and consumers. Omnivores could be secondary and tertiary consumers.

Another important link relation in the food web is the decomposers. The decomposers eat all the dead and waste products of producers and consumers. They play a very important role in decomposing waste and returning useful elements to the soil and environment.

The producers (plants) use these useful elements to produce food in the presence of sunlight energy. Thus, the plants are at the beginning of the cycle.

Activity 4.3

Making the Food Web/Chain

What I need?

- A woollen ball or thick coloured rope.
- 5cm by 5 cm square paper or card per student.
- A Marker.
- Pin.

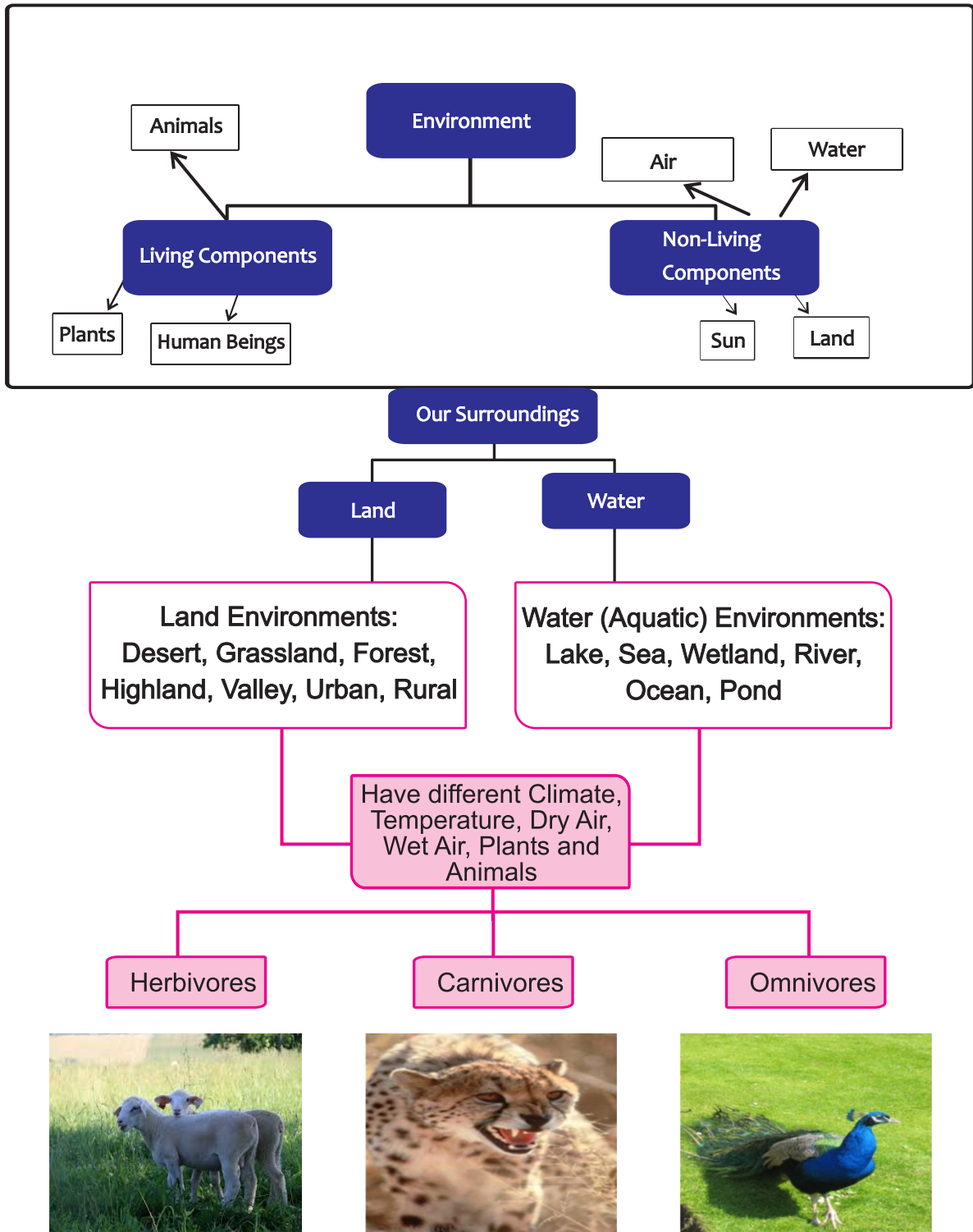
What to do?

Brainstorm and develop a list of Producers, Consumers and Decomposers. Do not forget to include the Sun.

1. Ask the students to select either a producer, consumer, or decomposer.
2. Write the name of the selected producer, consumer or decomposer on the card with a marker.
3. Pin the card on the shirt or scarf.
4. Ask the students to think of their own role and connection to other producers, consumers, decomposers and the sun in the food web.
5. Now move to an open area, corridor or rearrange the children in the class in the form of a circle.
6. Start of the connection as the Sun, by swirling the wool or thread on a finger and throwing the ball to the plant.
7. After throwing the ball of wool to the plant, state the connection of sun with the plant/tree.
8. Next, ask the child playing the role of the plant to swirl the wool on a finger and throw the ball to another student playing the role of a primary consumer. Ask the student to state the connection.
9. Continue this process; there could be multiple connections to one role too. Observe the Food Web. How do you feel?

Teacher's Note: The teacher needs to identify the importance of the food change along with the students and highlight the importance of all animals and plants in the Food Web.

Summary

Environment
Animals
Living Components
Plants
Human Beings
Air
Water
Non-Living Components
Sun
Land
Our Surroundings
Land
Water
Land Environments: Desert, Grassland, Forest, Highland, Valley, Urban, Rural
Water (Aquatic) Environments: Lake, Sea, Wetland, River, Ocean, Pond
Have different Climate, Temperature, Dry Air, Wet Air, Plants and Animals
Herbivores
Carnivores
Omnivores

Review Questions

1. Circle T for True and F for False Statements:

   a) Land is not a living component of the environment. T F

   b) Human being is a living component of the environment. T F

   c) Grasslands have many trees. T F

   d) Wetland is a water environment. T F

   e) Herbivores eat plant and animals. T F

   f) Animals that eat herbivores are secondary consumers. T F

   g) Animals that eat carnivores are secondary consumers. T F

   h) All Food Chains start with the Sun. T F

2. Circle the Best Answer:

   i) What is not included in the living components of the land environment?

      a) Flowering Plants
      b) Frogs
      c) Iron Rock

   ii) Which is not a type of environment?

      a) Garden
      b) Storeroom
      c) Pond

   iii) Which of these are not found in the food web?

      a) Air
      b) Sun
      c) Human

iv) If plants have needle like leaves to which environment would they belong?

a) Forest
b) Desert
c) Grassland

v) What is the key role of decomposers?

a) Break down dead animals.
b) Break down living plants.
c) Provide food for animals.

vi) In which group would you place human beings?

a) Carnivores
b) Omnivores
c) Herbivores

vii) What is the correct order of the levels in a food chain?

a) Consumer - Producer - Decomposer
b) Decomposer - Consumer - Producer
c) Producer - Consumer - Decomposer

viii) Which one of the following animal is a decomposer?

a) Wolf
b) Mould
c) Bird

Use the food chain to answer the two questions that follow
Sun-Plant-Frogs-Snakes-Hawks

ix) Which living thing would decrease, if the number of frogs increased?

a) Hawks
b) Snakes
c) Plants

x) Which best describes the frog?

a) Decomposer
b) Consumer
c) Producer

3. Give reasons of the following:

Decomposers are an important part of the food chain.
Plants and animals are important for each other.
The environment has many living and non-living components.

Project:

Making Different Environments

What I need?

- Coloured Paper (green, brown, blue)
- Clay or plasticine
- Pictures or Clay/plastic animals and plants

What to do?

- Here are some things that you can do to find out different types of environments.
- Discuss with your family members, teachers, peers and senior fellows to identify different types of environments and the living animals, plants and non-living components of the environment.
- Visit the library and search the internet.
- Write in the below table the name of the environment and the animal, plants and non-living things in the environment from your discussions and visit.
- Make a paper, clay or plasticine model of any environment of your choice.
- How do you feel?

What I found ?

Types of Environments	Living Things and unique features (Write/draw)	Non-Living Things

Activity Questions

1. What is common in all environments?
2. What is different in all environments?
3. Discuss with your family members and elders, teachers, peers and senior fellows the changes we humans have introduced in these environments. How have we changed these environments? You could develop a timeline of the changes over the past 100 years. Make and Display a poster on these changes in your school, community, internet, local newspaper and school magazine. Run a School Campaign on Conservation of the Environment.

MATTER AND ITS STATES

The world is made up of different materials. Have you ever observed and classified these material objects in your surrounding? Now look at the materials in the picture given below. What can you observe? How can you classify a coin, iron nail, book, water and the thing inside a blown up balloon? Talk to your class fellows and classify the materials as solid, liquid and gases. Note your classification for the next activity.

In this chapter you will learn about:

- Three States of Matter.
- Effects of Heat on Solids, Liquids and Gases.
- Mixing of materials.
- Soluble and Insoluble Solids.
- Separation of Materials.

All the students will be able to:

- Identify three states of matter with examples.
- Compare solids, liquids and gases on the basis of shape and volume.
- Define matter and give examples.
- Observe a demonstrate and explain how matter changes its state on heating.
- Explain how one state of matter (solid, liquid and gases) dissolves in the other.
- Predict and investigate how various materials mix one another.
- Separate insoluble solids from water by decantation and filtration.

Three States of Matter

Activity 5.1

Observing Materials

- Identify three states of matter.

Observe the materials by using your senses.

Touch your desk. How does it feel; hard or soft?

Figure 5.1 Child pressing the desk

Activity Questions

Can you change its shape?
Can you compress it? How would you classify your desk?
Record your observations. Place a tick in the table given below:

Object	Hard	Soft	Can be Compressed	Cannot be Compressed	Can Change Shape	Cannot Change Shape
Desk						

What did you conclude?

You must have concluded that most solids are hard substances. They cannot be compressed. They have a definite shape. Can some solids change shape? Observe materials in your surrounding and find out solids that can change shape.

Activity 5.2

Observe the material in the container.

What is its shape? How much space does it occupy?
Take out the Material. Place it on the table.

Figure 5.2 Solid in container

Did the material change shape on the table? Does the material occupy space on the table?

The amount of space a material object occupies is called its volume.

Let us find out the volume of the material object using mathematics.

Measure the material object's length, breadth and height with the help of a centimeter scale.

Figure 5.3 Solid on table

Record your measurement below and find the volume:

Length	cm
Breadth	cm
Height	cm
Volume	Length cm x Breadth cm x Height cm _______cm x ______cm x ________cm
Volume	______________cm^3

Does the volume of the material change in the container and on the table?

What do you conclude from this activity?

You must have concluded that solid materials have a definite volume.

Activity 5.3

Compare solids, liquids and gases on the basis of shape and volume.

Now, take some water in a jug, touch it with your finger. How does it feel? Observe the shape of the water in the jug. Pour it into a drinking glass. Observe the shape of water in the drinking glass.

Is the shape the same in the drinking glass as in the jug?

Can you change the shape of water?

What did you conclude?

Figure 5.4 Pouring water from a jug into a glass

You must have concluded that liquid changes shape in different containers.

Do liquids occupy space and have a volume? Let us find out by doing an activity.

Take some water in a glass. Measure its volume by pouring it into a graduated container. Now, pour it into a bottle carefully without spilling any water. Measure the volume again.

Does the liquid have a definite shape? Does the liquid have a definite volume?

Did you observe that the shape of water in the glass is different from the shape of water in the cylinder? Did you observe that the shape of water in the cylinder is different from shape of water in the bottle?

The shape of liquid changes when it is poured into containers having different shapes. The shape of liquid depends on the container. The volume of liquid remains the same. Liquids have a definite volume.

Project:

Making a Graduated Cylinder

What I need?

Translucent or clear bottle/container; pointer or pen, masking tape / paper and glue, a graduated cylinder from your laboratory and ruler.

What to do?

- Place a strip of tape or strip of paper with glue from top to bottom on the outside of the bottle/container, as shown in the picture.
- Now, using the graduated cylinder and measure out 5 ml of water.

Figure 5.5 Measuring Container.

- Pour this water carefully into the bottle/container without spilling any water. Draw a thin line on the tape at the level of water in the container.
- Note that the top of the line should be in line with the surface of the water.
- Repeat this process until the bottle/container is almost full. You should have marks for 5, 10, 15….
- Using a ruler, sub-divide the spaces in between each mark of 5 into 5 equal parts. Each mark will represent 1 ml.
- You now have a graduated cylinder of your own.

Can you make other measuring containers? Make a measuring container for measuring milk at home through the method described above.

Teacher's Note: If a graduated cylinder is not available, use a scale to mark on the glass or bottle. Make a low cost measuring cylinder.

Activity 5.4

Take balloons of different shapes and sizes and inflate them by blowing air in them.

Does gas have a definite shape? Does gas occupy space?

Now, untie one of the balloons and observe. What happens?

Where did the air go? Does air have a definite volume? Can you compress gas?

What did you conclude?

Figure 5.6 Gases have no definite shape in Balloons.

You must have concluded that gases have no definite shape. Gases occupy space but have no definite volume. Gases can be compressed.

Activity 5.5

Now that you have studied the three states of matter.

Can you observe and classify the materials below?

What is in glass 1?

What is in glass 2? What is inside the tyre?

Figure 5.7. Inside Glass 1, Inside Glass 2 and Inside Tyre

Name of the material	State of material	Have definite shape	Have no definite shape	Have definite volume	Have no definite volume

The World is made up of many materials similar in properties to these types of materials. Identify more materials with similar properties from your surroundings to the ones given above. Identify materials that are hard and cannot change shape. Identify materials that you can pour. Identify materials that change shape and volume. Share the name of the materials with your class fellows. Bring material of your choice to the class and present its properties.

Teacher's Note: The teacher should engage the students in feeling the weight, observing shapes and measuring volume. He/she should also provide the materials and engage students in observing, measuring and calculating the volume.

Activity 5.6

Define matter and give examples.

You have observed many properties of Solids, Liquids and Gases in the previous section.

Do the solids, liquids and gases have mass?

What do you think?

Why do you think so?

Figure 5.8 (a) Solids have Mass

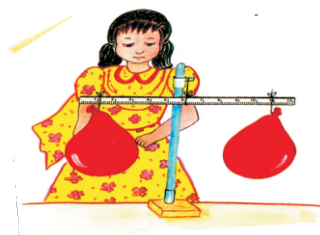



Figure 5.8 (b) Gases have Mass

Measure the masses using measuring scales.

Make simple balances as shown in the figures below.

Using it, measure the masses of gases, liquid and solids.

What do you conclude?

All the solid, liquid and gaseous materials that you have observed are Matter. Matter has mass and occupies space.

Figure 5.9 Mass of Air

Figure 5.10 Liquids have Mass.

Teacher's Note: The teacher needs to engage the students in measuring and comparing masses of different solids, liquid and gas materials in the surrounding. The students could visit the market, compare masses and weights of different types of objects. He/she can ask the students to compare masses of same size objects. Also, he/she can ask the students questions during observation.

Effects of Heat on Solids, Liquids and Gases

Activity 5.7

Observe a demonstration and explain how matter changes its state on heating.

Take some pieces of ice in a bowl. This is water in solid state. Heat it over the burner. Observe what happens. Solid ice starts to change into liquid i.e., water. After some time, there is no ice left. But there is water in the containers.

Can other solids change into liquids?
Yes, other solids can also can change into liquids at a high temperature.

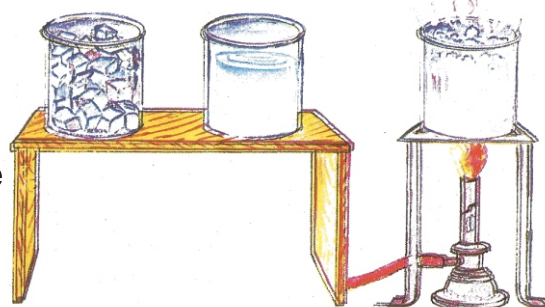



Figure 5.11 Demonstrating Change of State

Activity 5.8

Pour some water in a pan and heat it. What happens when water is boiled? Water changes into water vapours.
When water vapour is cooled, it changes back into water. This can be observed under the figure.
Water vapour is the gaseous state of water.
Can other liquids change into gases?

Figure 5.12 Change of state

Explore the uses of change of state of matter on heating in daily life. Talk to your teachers, peer and senior fellows. Explore from books, websites, TV and radio or through text messaging your family members.

Teacher's Note: The teacher should demonstrate this activity and instruct the children to observe the steam from a distance.
Observe the vaporization in a cup of tea / pot at home or the school under the supervision of the parent or teacher.

Mixing of Solid Liquids and Gases

- Explain how one state of matter (solid, liquid and gases) dissolves in another.
- Predict and investigate how various materials mix with one another.
- Separate insoluble solids from water by decantation and flirtation.

Solids, liquids and gases mix together to form mixtures. We are surrounded by different types of mixtures. Soft drinks, are all mixtures. Solution is also a kind of mixture. Let us do an activity to form a solution.

Activity 5.9

Take some sugar in a glass. Pour some water in it. Stir it well. Observe what happens to the sugar crystals. The sugar crystal disappears in water. Taste the water.

Did you observe that the taste of water has changed to sweetish?

The disappearance of sugar and the change of taste of water are due to the sugar dissolved in water.

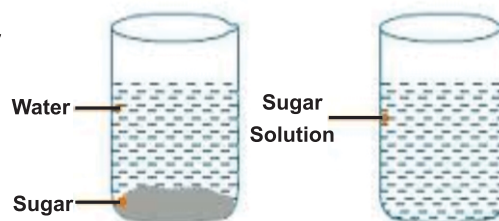



Figure 5.14 Dissolving sugar in water

Activity 5.10

Take some water in a glass. Add some sand in it. Stir it well. Observe what happens to the sand particles. The sand particles do not disappear in the water. The sand particles remain suspended to form a sand and water mixture. Predict what will happen if salt is added to water? Can you separate the salt and sand from the mixture? Find out. Talk to class fellows and elder brother and sister.

Figure 5.15 Dissolving of material in water

Activity 5.11

Mixings and Separating Soluble and Insoluble Solids

What I need?

- Sand, salt, sawdust
- Cloth piece or filter paper
- Jars 4-5
- Spoon
- Water
- Funnel

Figure 5.16 Separating Mixtures

What to do?

1. Work in groups.
2. Take some water in a beaker or a jam jar.
3. Add some sand, salt and sawdust.
4. Mix it well.

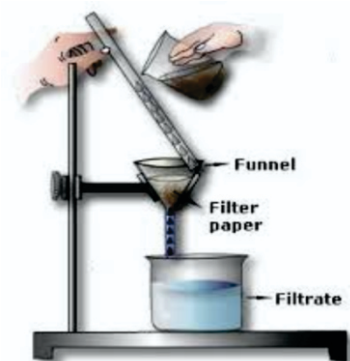



Figure 5.17: Filtration Set-up

Activity Questions

1. What happened when you added water?
2. Which materials dissolved in water; which materials sank to the bottom; which material floated in water?
3. You must have observed that the salt dissolved in water; the sand sank to the bottom; and the sawdust floated on the top.

What to do next:

1. Set up the filtration apparatus, as shown in the figure.
2. Fold the filter paper as shown and place it in the funnel.

Figure 5.18 Folding Filter Paper

Teacher's Note: If a filter paper is not available then use a piece of cloth.

Figure 5.19 Separated Material

This process of separation of solute and solvent from the mixture is called Filtration. In this process, the bigger size particles of soil and the saw dust that cannot pass through the filter paper will collect on the filter paper. The salt solution will pass through and collect in the beaker.

Another method to separate the mixture is called **Decantation.**

- In this method, you may mix the sand and water.
- Allow the sand and water to stand for some time. The sand will settle down.
- Now, gently pour off/decant the clear water mixture into another container, as shown in the figure above.
- So by the process of decantation, you can separate insoluble materials from the mixture.

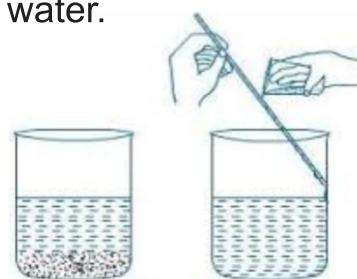



Figure 5.20 Decantation

What did you learn about mixture and separation of soluble and insoluble solids? How can you apply this in separating mixtures in daily life? Talk to your class fellows and elder brothers and sisters. Share some examples.

Our world is made up of many types of materials and mixtures of solids, liquids and gaseous materials. Some materials such as salt and sugar dissolve in water. We can identify these materials as soluble materials. Some materials such as sand and sawdust do not dissolve in water. We can identify these materials as insoluble materials.

Teacher's Note: Students could be guided to work in pairs or groups to brainstorm. They could be asked to share suggestions on ways to separate mixtures.

Do you know?

There are several impurities that remain either dissolved or undissolved in water? These impurities could be separated through the process of filtration through a home made water filter of sand and gravel or a filtration machine.

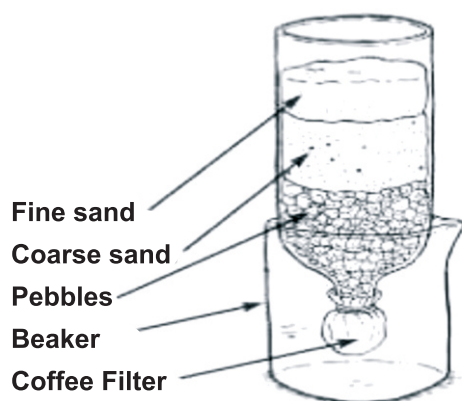
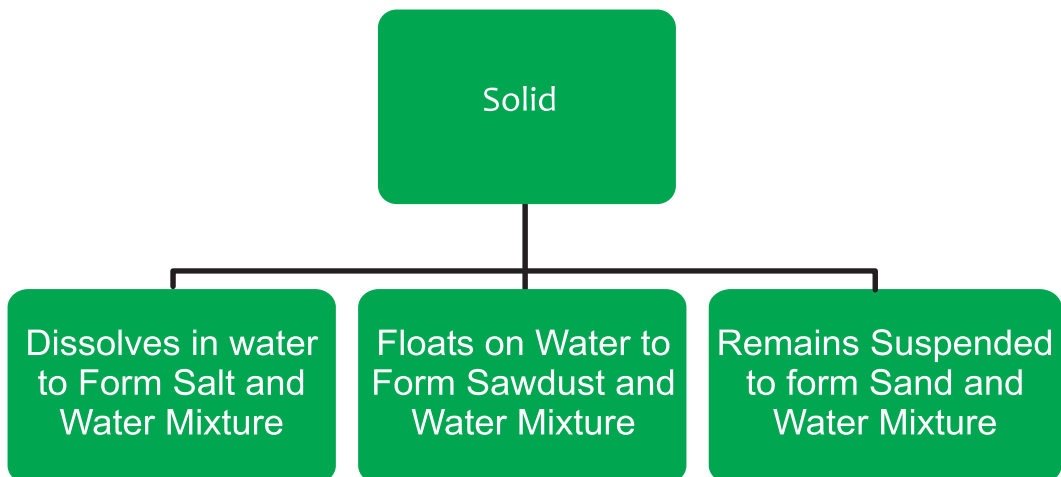
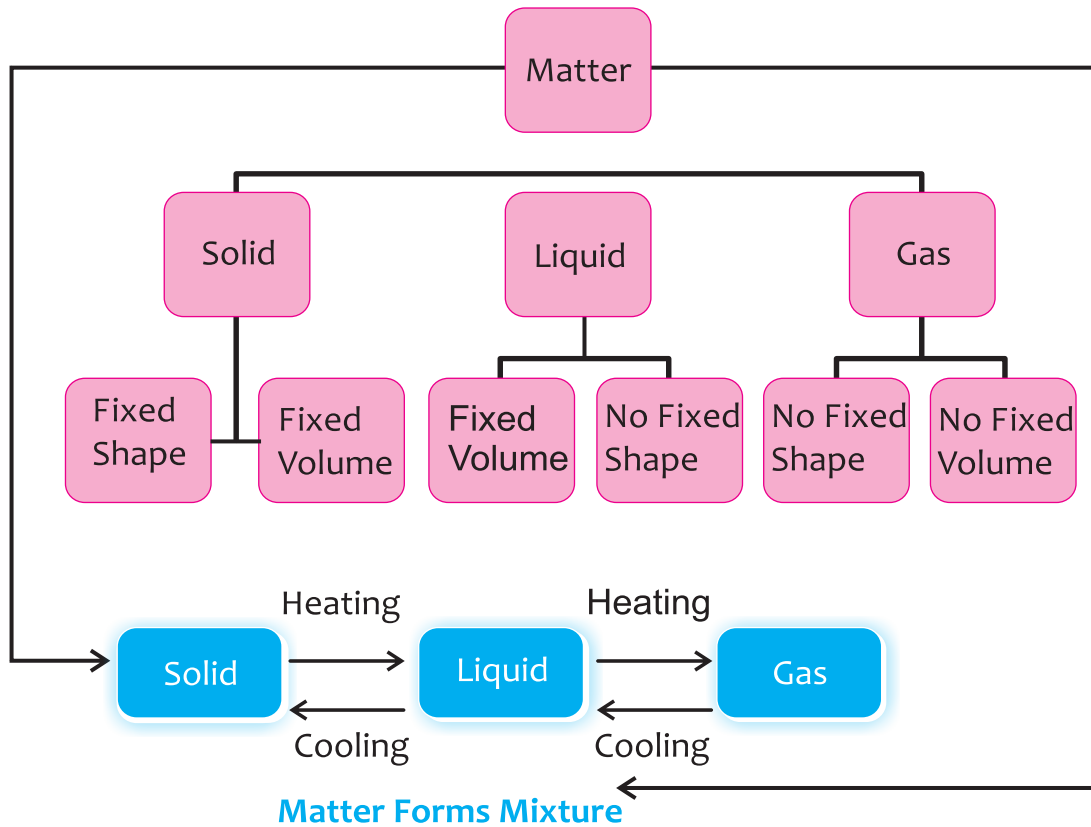



Figure 5.21 Filters for Home

Summary

Matter
Solid
Liquid
Gas
Fixed Shape
Fixed Volume
Fixed Volume
No Fixed Shape
No Fixed Shape
No Fixed Volume
Heating
Heating
Solid
Liquid
Gas
Cooling
Cooling
Matter Forms Mixture
Solid
Dissolves in water to Form Salt and Water Mixture
Floats on Water to Form Sawdust and Water Mixture
Remains Suspended to form Sand and Water Mixture

Review Questions

1. Circle T for True and F for False Statements:

(i)	Solids do not take the shape of the container they are kept in.	T F
(ii)	Gases do not change volume when transferred from a small ball to a large ball.	T F
(iii)	Liquids take the shape of a container they are placed in.	T F
(iv)	Solids that dissolve in water can be separated through filtration.	T F
(v)	Tea leaf can be separated from tea by filtration.	T F

2. Explain with examples:

A. All forms of Matter (solid, liquid and gases) have mass and occupy space.
B. Ice changes to water on heating.
C. Sugar dissolves in water and plastic pieces float on water.
D. A gas changes into liquid.

Project:

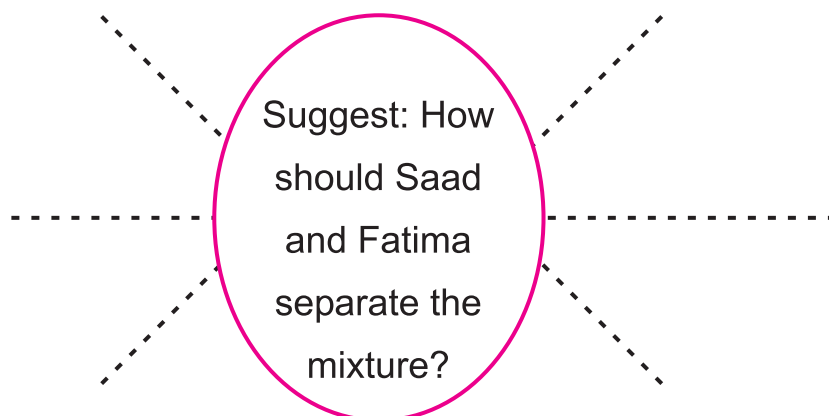
Story:

One day, there was repairing work going on in the kitchen. As the masons were cementing the floor, there was lot of sand in the kitchen. Suddenly, our house cat ran into the kitchen and dropped the salt's and tea leaves' jar on the floor. And the entire salt and tea leaves got mixed with the sand.

Mother was very angry as she wanted to use the salt. Hence, Saad and Fatima set out to explore and separate the salt from the sand and tea leaves.

How can you help Saad and Fatima in separating the salt from sand and tea leaves from the sand and salt?

Work with your pair or group.

Brainstorm:

HEAT AND ITS MEASUREMENT

Have you ever observed what happens when you leave your cold ice lolly and ice cream on the table? The ice cream melts and become warm. Have you observed what happens when you leave a hot cup of tea on the table? The hot tea becomes cold after some time. Why does this happen? All this happens because of the flow of heat due to the difference in temperatures.

In this chapter you will learn about:

- Know that Heat is a form of energy.
- Understand the difference and relation between heat and temperature.
- Measure the temperature using different types of thermometers.
- Differentiate between clinical and laboratory thermometers.
- Draw a labelled diagram of a thermometer.
- Safety measures of using thermometers.

All the students will be able to:

- Define heat and temperature.
- Draw and label the device for measuring temperature.
- Measure and record the body temperature using a laboratory thermometer and a clinical thermometer.
- Suggest the safety measures required for using thermometers.

Figure 6.1 Hot and Cold Materials

Heat and Temperature

Figure 6.2: Cold Ice Water

When something is cold like ice, we say that it has low temperature. Something which is hot, like hot tea has high temperature. Are heat and temperature two similar things? That's right! Heat and temperature are two different things.

Figure 6.3 Hot Cups of Tea

Temperature tells you how hot an object is. The measurement of the hotness and coldness of an object is called temperature. The instrument used to measure temperature is called the thermometer.

Figure 6.4 : Heat Flow From High to Low temperature

But heat is a form of energy which flows from a region of high temperature to a region of low temperature. As a result of this flow of energy from a region of high temperature to a region of low temperature, the warmer materials cool down and the cooler materials warm up. Do you know how the cold water in bucket in winter warms up when hot water is poured in the bucket? The reason is that as the energy flows from the hot water to the cold water, it warms up the cold water. Heat energy is measured in Joules (J). Joule is the unit of energy used by the International Standard of Units (SI).

James Prescott Joule, an English physicist, established that the various forms of energy mechanical, electrical, and heat are basically the same and can be changed from one form into another. Ref: Encyclopaedia Britannica.

Teacher's Note: The teacher needs to ask more questions, give examples and demonstrate the flow of energy from high to low region in order to facilitate students' learning.

Activity 6.1

Investigating Heat and Temperature

What I need?

- A large trough containing tap water
- A glass or beaker containing hot water

What to do?

1. Touch the surface of hot water and tap water in the large trough and beaker. Record how do you feel in the table below.
2. Place the beaker or glass containing hot water in a large trough containing tap water.
3. After 20-25 minutes, again touch the surface of both vessels of water in the containers.

What I observed?

Copy the following table in your exercise book. Record your observations by completing the sentences given below:

When I touched the surface of hot water in the beaker…	When I touched the surface of tap water in the trough..
When I touched the surface of water in the beaker after 20-25 minutes…	When I touched the surface of water in the trough after 20-25 minutes ...

Activity Questions

1. What can you say about the temperatures of beaker and the large trough bowl?
2. Which has the higher temperature: The Beaker or a large trough before placing it in the trough?
3. Why was there a difference in temperatures after 20-25 minutes?
4. What can you conclude about the above activity?

Teacher's Note: The teacher needs to arrange the water, the hot water and the cold water. The teacher has to ensure that the water is hot but not boiling, hot so as to avoid any burns being inflicted on the children.

Measure and record the body temperature using laboratory thermometer and a clinical thermometer.

Temperature and Thermometer

From your observation in activity 1, can you tell the exact temperature from your observation of the water in the glass and bowl? Do you think that your sense of touch is good enough for measuring temperature?

Your sense of touch cannot tell you the degree of hotness accurately, as your senses are not reliable.

Activity 6.2

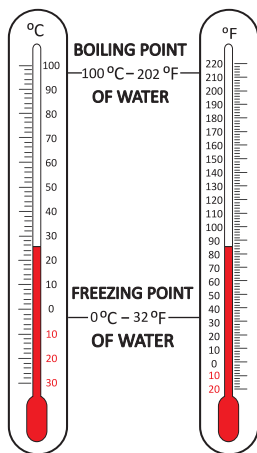
Take a luke warm bowl of water, a cold bowl of water and a bowl of water at room temperature. Touch the warm water. How hot does it feel?

Figure 6.5 Using the Sense of Touch

Now, dip the same finger/hand in the cold water for a few minutes. Take out your finger/hand and dip it in the warm water. How does it feel now? Now, take out your hand and dip it at room temperature. How hot does it feel?

Thermometer is the instrument that is used for measuring temperature accurately. Whenever you have fever, your mother and the nurse takes the temperature of your body. Can you identify from the figures of thermometers on the right, the thermometer that your parents uses at home? Yes, they use the Clinical one. Clinical thermometer is used to measure body temperature. Do you know about the use of the Laboratory Thermometer? Laboratory thermometer is used in Laboratories. Let's find out the differences between the two.

Figure 6.6 Measuring Scales of Temperature

Teacher's Note: The teacher needs to demonstrate this activity and take safety measures in handling and pouring warm water.

Measuring scales of temperature
Centigrade and Fahrenheit

What is the temperature today? Have you observed that the temperature of the day is in degrees Centigrade (°C)? Have you observed that your body temperature is given in Fahrenheit (°F)? There are two common scales for measuring temperature. When you measure in Fahrenheit, the freezing point of pure water on the Fahrenheit scale is 32 °F and boiling point (at sea level) is 212 °F. Meanwhile, the freezing point of water on a centigrade scale is 0 °C and boiling point is 100 °C.

Do you know that your normal body temperature is 98.4 °F?
Do you know that the Boiling point of water is different in Karachi and Islamabad?

Suggest the safety measures required in using thermometers.

Safety Measures When Using Thermometers

- Always wash clinical thermometer before putting it in your mouth.
- Clinical thermometer contains mercury, a very dangerous substance. Stay at one place and do not move when the clinical thermometer is in your mouth.
- Clinical thermometer requires a jerk in order to lower down the temperature in it. Do it very carefully under your teacher's or an elder's supervision.
- Place the thermometer back in its cover after using it and store it in a safe place.

- If broken, handle the pieces of glass carefully as broken glass pieces can hurt your hands.

Differentiate between clinical and laboratory thermometers

Laboratory and Clinical thermometers are different from each other in many ways. Let's find out the differences through an activity.

Activity 6.3

Investigating the differences between laboratory and clinical thermometers

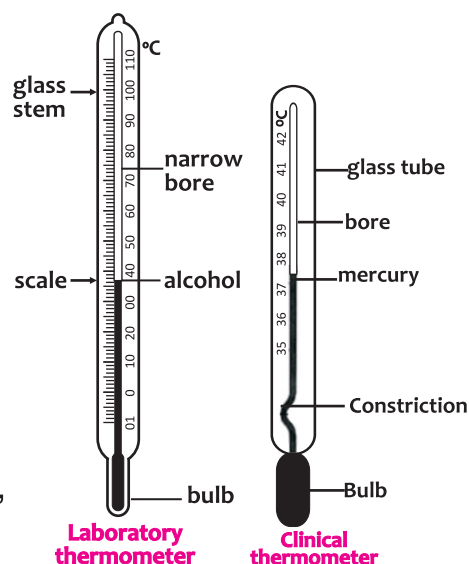
What I need?

- Laboratory thermometer
- Clinical thermometer

What to do?

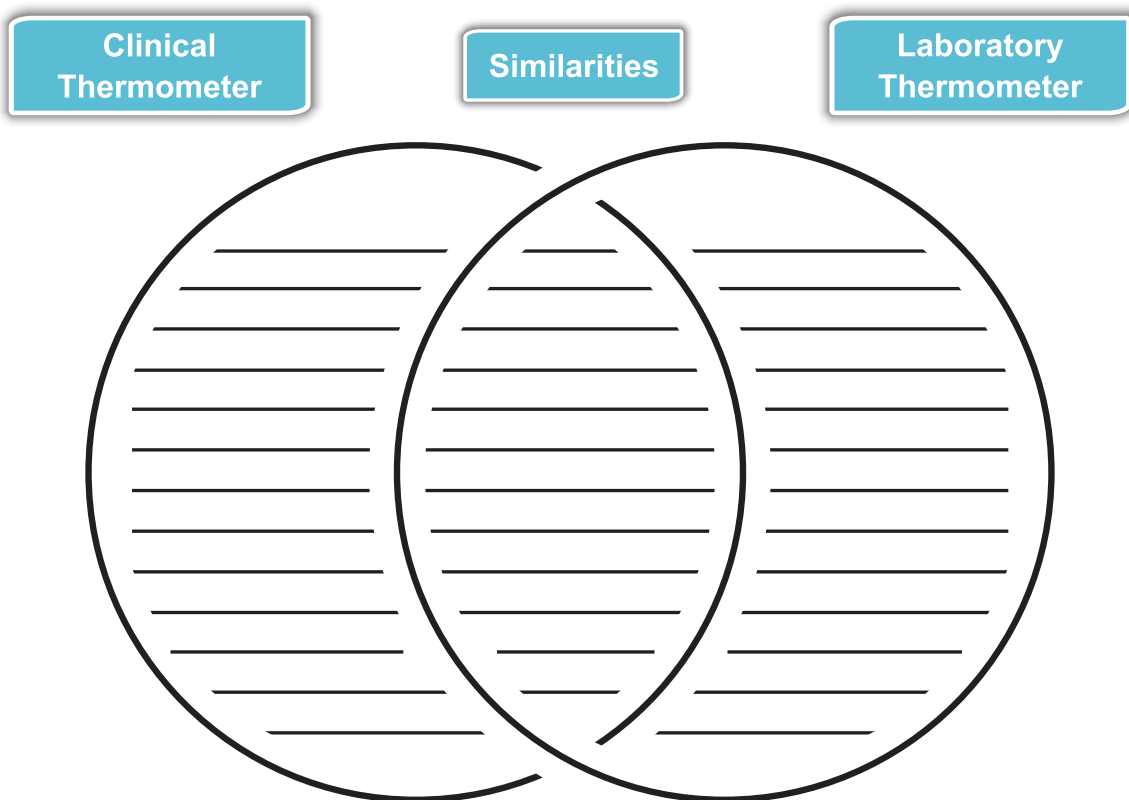
- Observe both the thermometers one by one and find out the differences in the following features:

  Scale, liquid used, highest temperature, lowest temperature, curved path (constriction)

- Record your findings in the table given below:

What I observed?

Types of Thermometers	Lowest Temperature Marked On Scale(°C/°F)	Highest Temperature Marked On Scale(°C/°F)	Liquid Used	Having Constriction (Yes/ No)
Laboratory thermometer				
Clinical thermometer				

Activity Questions

1. What is the highest temperature marked on the laboratory thermometer?
2. What is the highest temperature marked on the clinical thermometer?
3. What is the lowest temperature marked on the laboratory thermometer?
4. What is the lowest temperature marked on the clinical thermometer?
5. What is the use of constriction?
6. Are there any similarities between laboratory and clinical thermometers?
7. Write THREE differences between clinical and laboratory thermometers in the given diagram:

Draw and label the thermometer.

Activity 6.4

Draw and label the Parts of a Thermometer.

Measure temperature using clinical and laboratory thermometers.

Measuring Temperature

Activity 6.5

How to Measure temperature with laboratory and clinical thermometers?

What I need?

1. Three 100 ml beakers.
2. Laboratory thermometer
3. Clinical thermometer
4. Chilled water, (ice cold) boiled water, tape water

What to do?

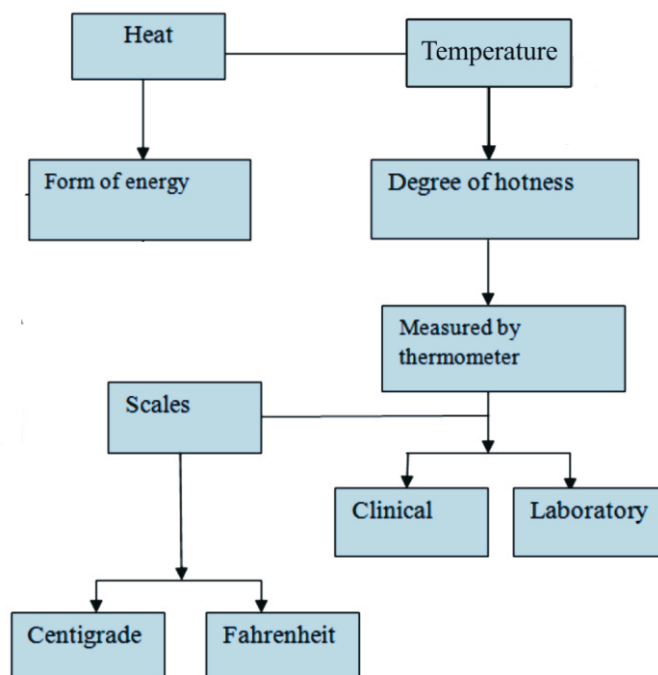
1. Take beakers / glasses and mark them as 1,2,3.
2. In beaker 1 / glass, pour some tap water. In beaker 2 / glass, pour some chilled cold water. In beaker 3 / glass pour, boiled water.
3. Take laboratory thermometer and find out its initial temperature. Your teacher will help you in finding out the temperature.
4. Put the thermometer in the tape water so that it does not touch the beaker / glass. Keep it in the same manner until temperature becomes constant. Keep your eye at the level of alcohol while it is in the beaker / glass. Note down the temperature and record it in the table given.
5. In the same way, record the temperature of water in beakers / glasses 2 and 3 also.
6. Now it's your turn. Take a clinical thermometer and keep it in your partner's mouth very carefully for 1.5 minutes. Record the temperature in the table.
7. Ask your partner to measure your body temperature.

What I observed?

Beakers	Laboratory Thermometer °C
Initial Temp.	
Beaker 1	
Beaker 2	
Beaker 3	
Students	Clinical Thermometer °C / °F
Partner 1	
Partner 2	

Activity Questions

1. Which beaker has the highest temperature?
2. Which beaker has the lowest temperature?
3. Is your body temperature different from your friend's body temperature?

Summary

Review Questions:

1. Write whether each of the following statements is TRUE or FALSE.

a) The highest temperature in clinical thermometer is 32 ^{o}C. T F

b) Normal body temperature is 98.4 ^{o}F or 37 ^{o}C. T F

c) Heat tells us how hot an object is . T F

d) Constriction in the clinical thermometer helps in preventing the flow of mercury downwards. T F

e) Temperature flows from higher region to lower region. T F

2. Tick the correct answer.

a) The properties used for heat:

i) hot, energy, cold ii) colour, smell, sound

iii) heavy, light, hard iv) circle, square, point

b) The lowest temperature in laboratory thermometer is

i) 10 ^{o}C ii) 0 ^{o}C iii) 100^{o}C iv) -10 ^{o}C

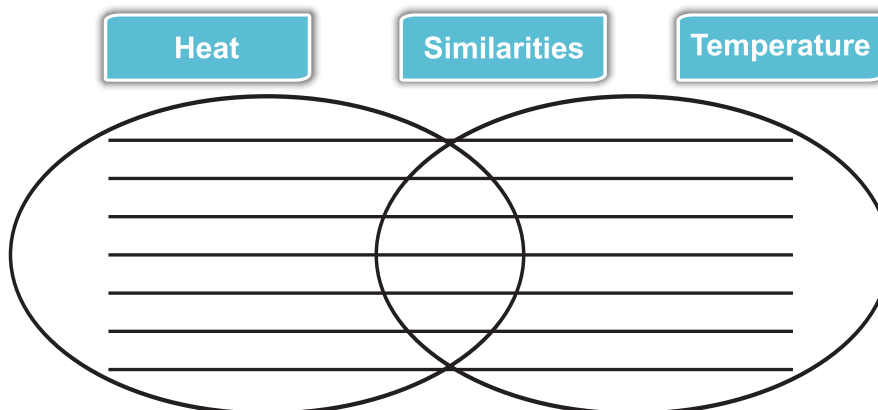
c) Which of the following liquids is used in the clinical thermometer ?

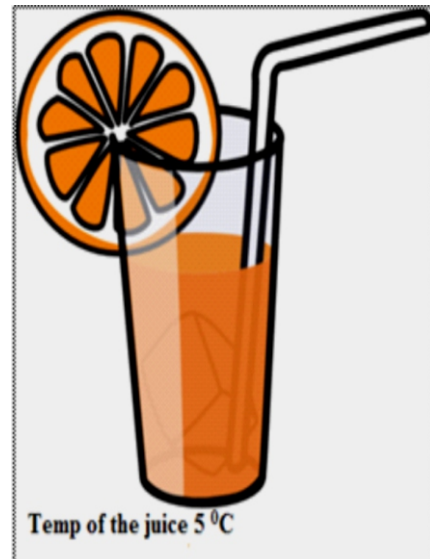
i) Alcohol ii) Mercury iii) Water iv) Oil

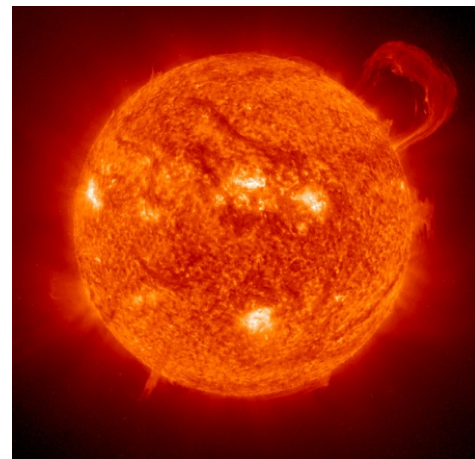
d) You should Not do one of the following while handling a clinical thermometer:

i) Stay at one place. ii) Wash it before use.

iii) Run. iv) Place it in cover.

3. Compare Heat and Temperature. How are heat and temperature similar and different? Write their similarities and differences.

4 For each of the following figures, show heat flow by drawing arrows, as being from the object to the surroundings or from the surroundings to the object.

Surrounding Temperature 0 °C

Surrounding Temperature 0°C

Temperature of Heater 200°C

The temperature at the Sun Surface is 5,500 degrees Celsius or 10,000 degrees Fahrenheit.

Project:

Find the information about more different types of thermometers with the help of the reference books available in your library. You can take the help of any adult in your family to find from the internet and share it with the whole class.

Make your own thermometer.

Materials required:

- Tap water
- Rubbing alcohol (surgical spirit available in school laboratory/ medical store)
- A narrow-necked plastic bottle about the length of the straw Red food colour
- A clear plastic drinking straw
- Modelling clay

Procedure:

1. Mix small and equal amounts of water and alcohol in a bottle but do not fill it more than ¼ of the bottle.
2. Add 2 drops of food colour.
3. Put the straw in the bottle but do not touch its end with the bottom of the bottle.
4. Keeping the other end of the straw out of the bottle's mouth, seal the mouth with the modelling clay tightly. However, keep the end of the straw open.
5. In order to test your thermometer, place your hands around the bottle and see what happens to the mixture.
6. Place your thermometers at different places. For example, window sill, sunlight, shady place, refrigerator, etc., and mark the lines on the bottle.
7. You can match your measured temperatures with the real laboratory thermometer.

CHAPTER 7

FORCE AND MACHINE

Have you ever thought why a rope walker does not fall off a rope? What makes the birds and the aeroplane fly in the open sky? How does the mechanic lift a car with the jack and spanner? The answer to each of these questions is that in each case, forces are acting on them.

In this chapter you will learn about:

- Force (Push and Pull)
- Effects of Forces
- Speed
- Simple Machines

All the students will be able to:

- Define force by giving examples.
- Demonstrate how force can change the position and the shape of an object.
- Design experiments to demonstrate that some objects can return to their original shape after the release of force.
- Investigate the ways in which motion of an object can be changed.
- Explore that the greater the force, the greater the change in the distance covered by the object.
- Define speed and its relation with distance.
- Define a simple machine by giving examples of commonly used machines from the environment.
- Design an experiment to show how simple machines make work easier.

Figure 7.1 Acting of force on bodies

Forces (Push and Pull)

Activity 7.1

Identifying Examples of Forces

Define force by giving examples.

Look at the picture and identify the examples of pull and push forces.

Figure 7.2 (a) Push

Figure 7.2 (b) Push and pull

A **Force** is a **Push** or **Pull.** When you lift your school bag, you apply the **Pull** force and when you strike a cricket ball with the bat, you apply the **Push** force. In both the cases, you are applying a force.

Figure 7.2 (c) Push and pull

Teacher's Note: The teacher should ask the students to look at the examples of forces, identify and define forces.

Demonstrate how force can change the position and the shape of an object.

Effects of Forces

- Forces can change the shape of an object.
- Forces can change the direction of an object.
- Forces can change the speed of an object.
- Forces can change the position of an object.

Figure 7.3 Effect of force on object

Activity 7.2

Investigating the effects of forces

What I need?

- Rubber band
- Tennis ball
- Plasticine
- Chair

What to do?

- Here are some things that you can do to experience the effects of forces.
- Copy the table below into your notebook and write down your observations.
- Take note of any changes in the shape and position of each object.

What I observed?

Things to do	Change in Shape or Position or Distance
Squash a lump of plasticine	
Pick up a water bottle/school bag and walk across the room	
Stretch a rubber band	
Roll a ball on the floor	

Teacher's Note: The teacher needs to arrange materials and guide students in experiencing its effect.

Activity Questions

1. Which objects are effected by the PUSH force?
2. Which objects are effected by the PULL force?
3. In your own words, write what you learnt about forces in the activity?
4. How does it feel when you apply force?

Activity 7.3

The Greater the Force, the Greater the Distance

What I need?

- Cricket ball and bat
- Measuring tape
- Playground/ cricket pitch

 Define speed.

What to do?

1. Your teacher will form groups of four or five students in a team.
2. Ask each member of a team to hit the ball using as much force as they can.
3. Measure the distance using a measuring tape.
4. Now, ask the same member to hit the ball using a light force.
5. Measure the distance once again.
6. Repeat steps 2-5 with every member.
7. Record the distance in the table provided below:
8. What I observed: (Remember to write your team members' names.)

Team Members	Distance with Greater Force (m)	Distance with Lighter Force (m)

Activity Questions

1. Which team member applied the greatest force?
   How do you know?
2. What happened to the ball when you applied greater force?
3. What happened to the ball when you applied lighter force?
4. In your own words, write what you learnt about greater forces in the activity?

Speed:

One of the effects of forces is to change the speed of an object. What is Speed? When your teacher calls you out of your seat, you move towards your teacher. You cover a distance from your seat towards the teacher. If you walk slowly, you take a longer time but if you walk faster; you take a shorter time to reach your teacher.

Figure 7.4 Fastest speed train

Speed is the distance you covered while walking towards your teacher in the time you took to reach there. Speed tells you how much distance you covered and how much time you spent to cover it.

The world's fastest speed train is made by China. It can travel at the speed of 302 mph. (Miles per hour).

Teacher's Note: The teacher need to guide students to work in pairs or groups, to brainstorm, record the effect of forces and feel forces.

How can we calculate speed?

We can calculate speed by using this simple formula:

Speed = Distance / Time

Where

- Distance is measured in kilometres (km) or meter (m).
- Time is measured in hours (h) or seconds (s).
- So speed will be measured in kilometres per hour (km/h) or m/s.

Problem

An athlete covers a distance of 150 meters in 30 seconds. Calculate his speed.

Data:

Distance = 150 m

Time = 30 sec

Speed = ?

Solution:

Formula : Speed = Distance / Time

= 150/ 30

5m/s Ans

Teacher's Note: The teacher should give other examples to the students by changing the values for the time and distance and situation.

Simple Machines

Activity 7.4

Identifying Simple Machines

- Define simple machine
- Give examples of simple machines from daily life.
- Identify types of simple machines.

If you are asked to open a soft drink bottle cap with your fingers, can you open it?

What would you bring to open it? Probably a bottle opener.

The bottle opener is like a simple machine.

Figure 7.5 Bottle opener (simple machine)

A **Simple machine** is something that helps us to do work. In other words, simple machines can make work easier for us. There are many types of simple machines in your surroundings. Find out.

Types of simple machines:

A **lever** is a stiff bar that rests on a support called a fulcrum which lifts or moves loads, e.g, A hammer.

A **pulley** is a simple machine that uses grooved wheels and a rope to raise, lower or move a load, e.g, for raising school flags each day.

A **wedge** is an object with at least one slanting side ending in a sharp edge, which cuts material apart, e.g, an axe used for splitting wood.

Figure 7.6 Simple machine

A **wheel** with a rod, called an axle, through its center lifts or moves loads, e.g, screw driver, handle is wheel and its shaft is axle. An **inclined plane** is a slanting surface connecting a lower level to a higher level, e.g, ramp.

A **screw** is an inclined plane wrapped around a cylinder, used to fasten objects, e.g, a wood screw.

A compound machine

A compound machine is a device which is made up of two or more simple machines. Most machines are compound machines.

- **Scissors** is a compound machine. It helps us to cut and therefore makes our life easier. Think what would happen if we did not have a pair of scissors.

  The simple machines that you could find in scissors are: lever, screw and wedge. Its handle works like a lever and edges are wedge.

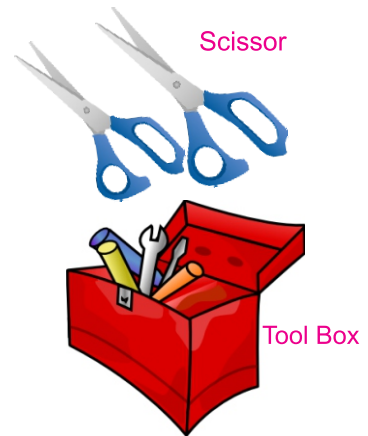



Figure 7.7
Simple machines

- In the toolbox, you may find a **Hammer** which is also a simple machine that helps us do work.
- **A wheel-barrow** is a compound machine that helps us carry heavy load from one place to another. It is made up of lever, screw and wheel and axle. Think where you may have seen a wheel-barrow being used the most and share you response with your classmates.

Figure 7.8 Wheel-barrow
(compound machine)

Crane and bicycle are examples of complex machines made up of different simple machines.

Figure 7.9 Complex machine)

Teacher's Note: The teacher needs to discuss the types of machines. He/she Helps the students in understanding the difference between simple and compound machines.

Activity 7.5

Screw-driver in the box

Demonstrate the use of some common simple machines.

What I need?

- A srew-driver
- Block of wood with a screw

What to do?

- Your teacher will provide you with a block of wood with a screw in it.
- Is it possible to remove the screw with your hands only?
- Try it out but be careful, do not to hurt yourself.
- Your teacher will show you how to remove the nail using a Screw-driver.

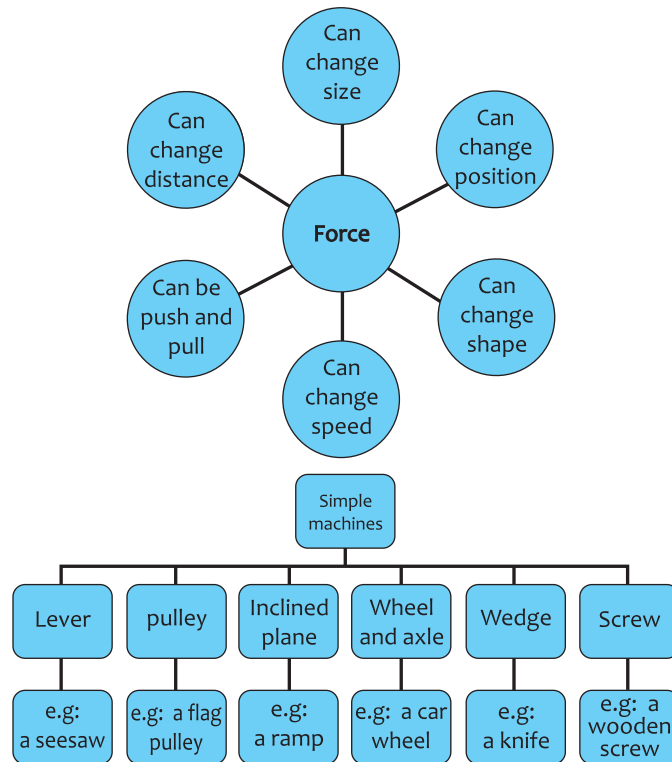
What I observed?

- Draw a labelled diagram of the screw-driver being used to take a screw out of a wooden block in your exercise book.
- Use short sentences or phrases to describe what happened when you used a screw-driver to unscrew the screw out of the wooden block.

Activity Question

1. What makes you think that a screw-driver is a form of a simple machine?
2. Was it possible to remove the nail out of the wooden block without a screw-driver? Why?

Teacher's Note: The teacher should ask the students to suggest ways to remove the nail. The teacher should demonstrate and explain.

Summary

Review Questions:

1. Fill in the blanks.

a) A machine is any tool which makes _______ easier.

b) A flag can be risen up with the help of a simple machine called _______ .

c) Friction is a type of _______ force.

d) We are able to stand on the floor due to _______ force.

e) When a force is applied on the clay dough, its _____ changes.

2. Do the following questions in your note books.

a) A train travels a distance of 12km in 2 hours. Calculate its speed.

b) Name 3 types of simple machines that you use for cutting.

c) How many ways can a wheel-barrow be used in our daily life?

d) What is the effect of force on the movement of an object?

3. Circle the best answer:

a) A force can change all of the following of an object **except:**

i) Size ii) mass iii) direction iv) Speed

b) Which of the following simple machines is used in raising the flag?

i) Scissors ii) Pliers iii) Pully iv) Wheels

c) Which of the following is **correct** for the simple machines?

i) Simple machines magnify the force you use.

ii) Simple machines change the direction of the force.

iii) Simple machines make things go faster.

iv) Simple machines make things move slower.

d) Girl is riding a bicycle. She covers a distance of 150 meters in 5 seconds. The cycling speed of a girl is:

i) 20 m/s ii) 30 m/s iii) 50 m/s iv) 70 m/s

4. Write T for true and F for false for each of the following statements.

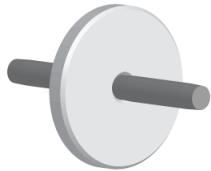
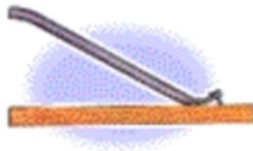
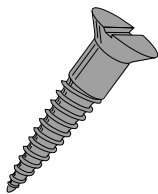
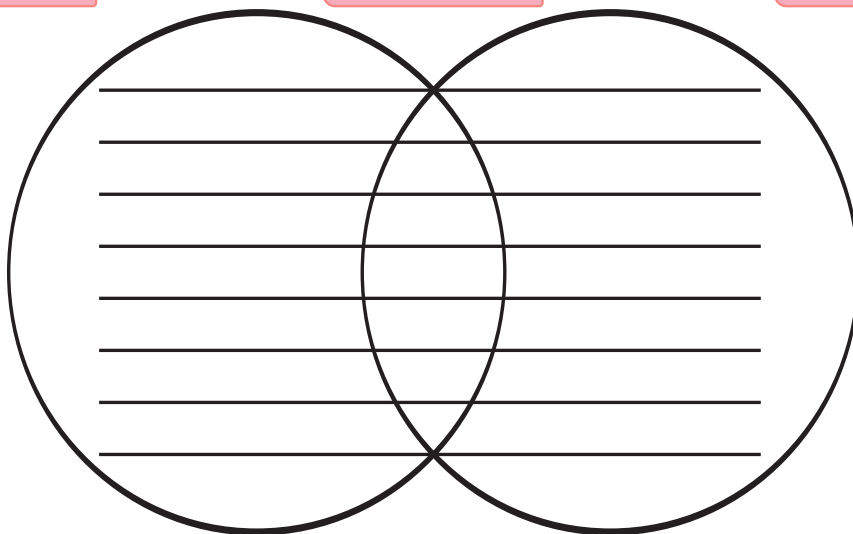
i) A simple machine makes our work easier.__________

ii) Wheel-barrow is a type of a simple machine._________

iii) The direction of a moving object cannot be changed by applying a force on it._______

iv) Speed is the rate of change of distance with time.______

v) Force is only a push._______

5. Identify the types of simple machines given below.

6. Compare simple and compound machines.

7. Observe the figure given below. How many types of simple machines can you find in the bicycle?

____

____

____

Inquiry Project:

1. Find out types of simple machines and compound machines in your home and school which makes your work easier. Make a list of the Simple Machines. Try to bring a simple machine to the school.

Hint: Look for things that help you to tighten something, things that help you to raise something to the top, things that help you to hold something, things that help you cut something…

2. Ali and Ayesha are moving from their house and have to move a load of 70 kg. They have to carry it from their old home to the new home. They live in a village and have no vehicle to carry it.

Design a device from the following materials in order to help them carry their load easily to their new home:

- 1 feet board
- Small wheels
- A strong string

SOUND

Have you ever heard the buzzing sound of a bee? Why does a vibrating rubber band produce sound? Why do you need to pluck a guitar string to produce a sound?

Figure 8.1 Sound

In this chapter you will learn about:

- Sound
- How sound is produced?
- Intensity of Sound (High and Low Sound)
- How sound travels?
- Noise and its effects on human health.
- Uses of Sound.
- Measures to reduce / Control sound Pollution.

All the students will be able to

- Investigate that sound is produced by vibrating objects.
- Differentiate between high and low sounds.
- Demonstrate that sound can travel through solids, liquids and gases but cannot travel through a vacuum.
- Interpret that the explosions in the core of the sun are not heard, as sound cannot travel in vacuum.
- Differentiate between noise and other sounds.
- Explore the effects of noise on human health.
- Suggest ways to reduce noise pollution and plan an awareness campaign on any one.

How is sound produced?

Investigate that sound is produced by vibrating objects.

Activity 8.1

Investigating sound vibrations

What I need:

- A tape recorder
- Rice grains
- A tissue paper
- An empty wide mouth tin can
- A large Balloon and sticks
- A rope/thread and grains

Make your drum by stretching and tying the balloon on the wide mouthed tin can.

Figure 8.2 Drum

What to do?

1. Touch the speakers of a tape recorder when your teacher plays a music, or a stretched balloon when your friend hits the drum with sticks.
2. Touch the speakers once again when your teacher plays slow music, or touch the stretched balloon when your friend hits it softly.

Teacher's Note: The teacher needs to arrange the materials and facilitate in making the drum and observation. The teacher needs to ask questions and show students how to observe.

3. Put some rice grains on a tissue paper and place the tissue paper over the speaker of the tape recorder and play a loud music. Or place it on the stretched balloon and hit the stretched balloon hard with the stick.
4. Repeat step 3 by playing slow music or hitting the stretched balloon softly.

What I observed:

Copy the following table in your exercise book. Record your observations by completing the sentences given below:

When I touched the speaker playing loud music...	When I touched the speaker playing slow music...
When I touched the stretched balloon while hitting it hard.....	When I touched the stretched balloon while hitting it softly.....
When loud music was played, the rice grains...	When soft music was played, the rice grains...
When the balloon was hit hard, the rice grains...	When the balloon was hit softly, the rice grains...

Activity Questions

1. Which part of the investigation proves that sound is produced by vibrating objects?
2. Briefly explain what you have learnt about the properties of sound in this investigation?

High and Low Sound

Sound could be high or low. The faster are vibrations, the higher is the sound; the slower the vibrations are the lower is the sound; for example; if you blow across the top of a flute, the air inside it vibrates. If the flute is shorter, the air inside vibrates faster by being blown and produces a higher sound.

Activity 8.2

Making bottle flute and playing with it.

What I need?

1. 3-5 glass bottles
2. Food colour (each group can get one colour)
3. Water

What to do?

1. Mix the given food colour in water to form your coloured water.
2. Fill the glass bottles with different amounts of coloured water, without filling any to the top.
3. Blow gently across the top of the bottle so that you can hear a note.
4. Now blow gently across all of the bottles.

What I observed?

1. What did you observe about the emitted sound?
2. When was the sound high and when was it low?

Activity Questions?

1. Write your own understanding of what you learnt in this activity.
2. How do you feel about this activity?
3. Why did you fill each bottle with different amounts of coloured water?

Sound is also a form of energy but it is not measured in joules, as heat energy. Sound is described in terms of intensity in Decibels.

Sound is described in the way it is perceived by healthy human ears. A sound that produces at an intensity level of about 135 decibels in common term is called "loudness," which is loud enough to cause physical pain.

Teacher's Note: The teacher needs to arrange the materials with the help of the students and make and observe the sounds. The teacher needs to ask questions to focus on the students' observations.

Medium for sound to travel through:

Demonstrate that sound can travel through solids, liquids and gases but cannot travel through a Vacuum.

The matter that sound travels through is called the medium. Sound travels faster through solids than liquids and gases because solids are denser and compact closer and support the fast transfer of sound.

The outer space is very quiet because outer space is a vacuum with no air as a medium for sound to travel through. Thus, all the explosion activity happening on the Sun cannot be heard on Earth as there is no medium for sound to travel through from the Sun to the Earth.

Activity 8.3

Sound travels through different materials

What I need:

- Cups made from different materials (similar size would be better as part of fair testing)
- You should get 3 of each of the following: metal, glass, ceramic, paper, plastic and foam
- A metal spoon
- Sand
- Water

What to do:

1. Half fill one set of cups with sand.
2. Half fill the other set with water.
3. Leave the other set empty.
4. Tap the mouth of each cup with a metal spoon.
5. Record your observations in the table given below.

Teacher's Note: You can also use large and small metallic scales and make them vibrate by keeping one end fixed. Or you can also use the small and large rubber bands. This will make the students understand more clearly about high pitched and low pitched sound.

What I observed:

Activities carried out by me	Description of sound
Sound travelling through sand (solid)/wooden table (solid)	
Sound travelling through water (liquid)	
Sound travelling through empty cups (gas)	

Activity Questions

1. How do the sounds differ?
2. What were the sounds like?
3. From which medium did sound travel through the best. Give reasons for your answer.
4. Why in space, astronauts cannot hear one another?

Pleasant and Unpleasant Sounds

- Differentiate between noise and other sounds
- Know that unpleasant sounds are noise.
- Explore the effect of noise on human health.

Sound is essential to our daily lives, but noise is not. Noise is generally described as an unwanted sound or sound which produces unpleasant effects and discomfort on the ears.

Figure 8.3 Unpleasant sounds

Do you know?

When Sound becomes noise? When it either interferes with normal activities such as sleeping, conversation, or disturbs one's quality of life. Noise (or sound) is measured in the units of decibels and is denoted by the dB. Noise which is more than 115 dB is not tolerable. The industrial limit of sound in the industries must be 75 dB, according to the World Health organization.

- Identify the sources and effects of noise.
- Identify the uses of Sound.
- Suggest ways to reduce noise pollution and awareness campaign on any area.

Fig 8.4 Noise pollution

What are the sources of noise pollution?

Noise can come from many places. The table below lists some sources of noise pollution:

Sources of Noise Pollution

Household Sources	Food mixer, grinder, vacuum cleaner, washing machine and dryer, cooler, air conditioners, loud speakers of sound systems and TVs, iPods and ear phones, computer games, dogs barking etc.
Social Events	Parties, weddings, people selling items using loud speakers, others shouting out offers and trying to get customers to buy their goods.
Commercial and Industrial Activities	Printing presses, manufacturing industries, construction sites, tractors, small factories, etc.
Transportation	Aero planes, trains, bikes without silencers, honking vehicles, etc.

Effects of Noise Pollution

Prolonged exposure of noise to a person will damage their eardrums, which may result in a permanent hearing loss. Other effects may include headaches, irritability and in extreme cases fright and hair loss.

Inquiry

Think of your own examples in your city, town or village.
List down sources, effects of noise and ways to reduce noise pollution. Visit a doctor, talk to family members and peers, observe your surroundings, and search on the internet for this inquiry. Also, search and report the uses of sound.

Measures to Reduce and Control Noise Pollution:

Listed below are a few things people and governments can do to make our communities and living places quieter.

1. Use of curtains, rug, dari and carpets.
2. Use double glazed windows.
3. Use soundproof rooms for noisy machines in industries and factories.
4. Ban vehicles that honk, bikes with damaged exhaust pipes and noisy trucks.
5. Built houses away from industries, airports, bus terminals and railway stations.
6. Law enforcers should check the misuse of loudspeakers in outdoor parties and public announcements systems.
7. Have silence zones near schools , colleges and hospitals.
8. Plant trees along roads to reduce noise pollution as they absorb sound.
9. Enforce the wearing of Ear pads in the Factory Area.

Summary

SOUND
What is Sound?
How is sound produced?
How does sound travel?
What are the qualities of sound?
What are the types of sound?
Sound is a form of Energy
Sound is described in decibels
Vibrating Objects & Vibrations
Medium solid, Gas Liquid
High and Low Sound
Pleasant Music
Un-Pleasant noise
Loudness is 135 dB
Faster in Solid
Noise pollution
Harmful effects on Health
Not in SPACE vacuum

Review Questions:

1. Match the correct meaning/phrase for the given words by writing the correct letter in the answer column.

Words	Meanings		Answers
Sound	A.	is matter that sound travels through	
Vibrations	B.	is the highness or lowness of sound	
Pitch	C.	is described as an unwanted sound	
Medium	D.	is a measurement unit for sound	
Noise	E.	is produced by vibrations	
Decibel	F.	means 'to shake or to move'	

2. How is sound produced?
3. When does one experience noise sound?
4. What are the mediums through which sound can travel?
5. Why doesn't sound travel in vacuum?
6. List main sources of noise in your surroundings.
7. Asma lives close to the airport. She experiences a lot of noise pollution daily as the aeroplanes continue flying over her house. What would you suggest she should do in order to avoid noise pollution?
8. Saad enjoys very loud music. Using his earphones, he listens to music every night before going to sleep. How will this affect his health?

Inquiry Project:

A Teacher teaches Grade IV Science. In order to show how sound vibrations are carried from one place to another, the teacher has challenged his/her class to design an investigation or experiment by using the following items that he/she provided them:

- 2 polystyrene cups
- 2 paper clips
- a length of string

  Copper string should be taken

Help the students design an investigation by writing a step by step process so that his/her class understands every step and will be able to carry out the investigation.

Society's Connection and Creating awareness about noise pollution

In your class form a group to create awareness about noise pollution and ways to reduce it. You can take the help from your teacher.

Make charts and write about noise pollution and its effects. Also, write about the ways to reduce it. Place these charts in your school soft boards, apartment's parking area, near your stairs, etc. Write a speech or poem about noise pollution and present it in your school assembly and community mosque.

ELECTRICITY AND MAGNETISM

Observe the following figures.

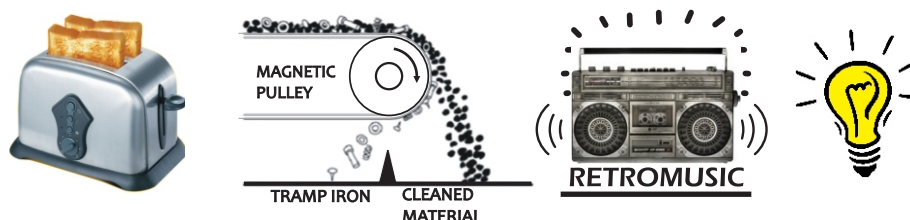



Figure 9.1 Examples from Daily Life

In small groups, discuss each of the following questions:

- The conveyor belt you see above is used to separate metallic objects from other garbage. How does it work?
- How do a toaster and tape recorder work?
- How do they receive energy?
- How does the bulb lit up?
- Would it still work when the wire is broken?
- Note your answers for later discussion.

In this chapter you will learn about:

- Introduction to Conductors and Insulators.
- Simple Circuit Switches.
- Natural and Artificial Magnets.
- Magnetic and Non-Magnetic Materials.
- Properties and Uses of Magnets.
- Methods of Magnetizing Materials.
- De-Magnetizing Materials.
- Temporary and Permanent Magnets.

All the students will be able to:

- Differentiate between conductors and insulators and also identify examples of these in daily life.
- Make a simple circuit.
- Differentiate between open and closed circuit.
- Differentiate between magnetic and non-magnetic materials.
- Recognize that magnet has poles.
- Demonstrate that like poles repel each other and unlike poles attract each other.
- Investigate that a freely suspended magnet always points in the N-S direction.
- Identify the various uses of magnets and magnetic materials in daily life.
- Differentiate between temporary and permanent magnets.

Conductors and Insulators

Activity 9.1

Predicting Conductors and Insulators

- Differentiate between conductors and insulators and also identify them in daily life.

Look at pictures of things that you use in daily life as given in pictures.

Predict from which of the following objects current passes.

Figure 9.2 Conductors and Insulators

Were you able to predict that current will pass through nail, key, paper clip, coins and screw?

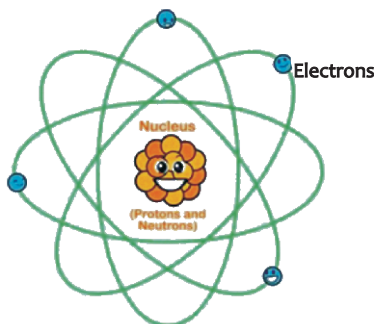
These materials from which current passes through are called **Conductors**. Conductors are materials that allow electricity's to easily flow through them. All the remaining materials are insulators. Insulators are materials that prevent electricity's flow through them. Let us study how conductors allow electric current from passing through them.

Simple Circuit: Everything in the world is made up of matter. Even your body is made up of Matter. Matter is made up of small building blocks called atoms. It has three fundamental particles, namely electrons, protons and neutrons.

Figure 9.3 The Atom

Electrons are negatively charged and protons are positively charged particles. Neutrons do not have any charge; therefore, they are neutral particles.

Atoms are made up of small particles. Some of them are called electrons or negative charges. Electric current is negative electric charges in motion in an electric path called the Circuit.

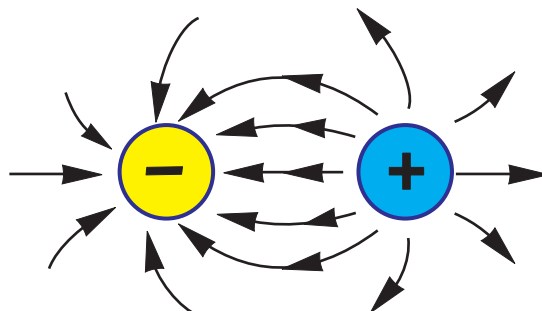



Figure 9.4 Flow of Current

A circuit is a loop or a path along which current moves. Were you able to guess that the things mentioned above worked due to the presence of electric circuit?

Activity 9.2

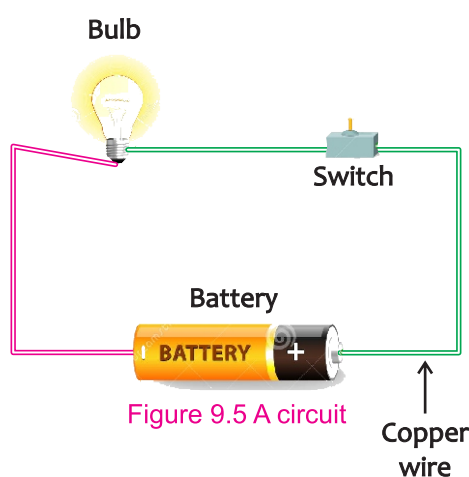
Making a simple circuit

What I need?

- Insulated copper wires, 3 pieces
- One cell or battery (source of energy)
- Tape
- Bulb
- switch

Figure 9.5 A circuit

What to do?

- Connect all the components given above as shown in the figure 9.5.
- First turn on the switch and record your observation in the given blanks.
- Turn off the switch and record your observation in the given blanks.

What I observed?

(i) When the switch is on…

____

(ii) When the switch is off…

____

Activity Questions:

(i) Which important factor is required to make the bulb lit up?

(ii) What is the source of energy for the bulb?

(iii) In your own words, write what you learnt about the circuit in the activity?

LEDs use less power (watts) per unit of light generated.
LEDs help lower electric bills. We can reduce our use of energy and save energy by using LED bulbs.

Open and Closed Circuits:

- Differentiate between an open and closed circuit.

Figure 9.6 (a) Light emitting diodes (LEDs)

The bulb will lit up in which of the following figures?

Tick the best answer.

Circuit A ☐ or Circuit B ☐

Figure 9.6 (b) Incandescent light bulbs

A closed circuit provides a complete path for the current to flow through.

An open circuit provides an incomplete path for the current to flow through.

Teacher's Note: The teacher needs to arrange the materials and engage the students in making the circuit. Open and Close the Circuit, observe all components of the circuit, name the parts and discuss the functions of all components of the circuit.

Activity 9.3

Investigating open and closed circuits

Figure 9.7 Open and closed circuit

What I need?

- Cell or battery
- tape
- Wires
- 2 bulbs
- Switch
- Plastic clip

What to do?

- Construct one circuit as shown in the fig.9.7 with the help of the components given above and mark it A.
- Construct second circuit as shown in the fig. 9.7 but connect a plastic clip instead of a switch and mark it B.
- Turn on the switch of circuit A and record your observation.
- Record your observation of circuit B.

What I observed?

Circuits	The bulb light up Yes / No?	The reason
A		
B		

Activity Questions:

(i) The bulb will light up in which circuit? Give the reason.

(ii) The bulb will not light up in which circuit? Give the reason.

(iii) What is your conclusion from this activity?
Were you able to conclude that the bulb is light up in the closed circuit, as the closed circuit provides a complete path for current to flow through?

MAGNET

Magnet attracts objects towards itself with a force called magnetic force and it is felt by an object in the magnetic field. i.e, a region around the magnet where the magnetic force is felt.

Magnetic materials are attracted to magnets; meanwhile, non-magnetic materials are not attracted to magnets.

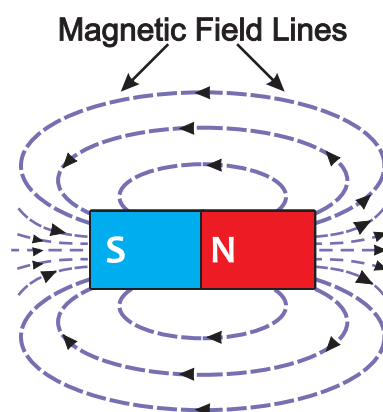



Fig: 9.8 Magnet

Activity 9.4

Investigating magnetic and non-magnetic materials.

What I need?

Investigate using a magnetic and non-magnetic materials.

- Horse shoe magnet, bar magnet or any magnet.
- Paper clips, iron nails, rubber band, keys, coins, pencil, needle, common pins, plastic ruler, eraser, etc.

What to do?

- Arrange all the materials given above separately on the table.
- Take a magnet near each object and note down as to which materials are attracted towards it and which are not.

What I observed?

Objects that are attracted towards the magnet	Objects that are not attracted towards the magnet

Activity Questions:

(i) Which type of materials are attracted towards the magnet?

(ii) Which type of materials are not attracted towards the magnet?

(iii) What would you conclude about the above activity?

You will observe

Paper clips, iron nails, keys, needle, coins and common pins are attracted towards the magnet. They are called magnetic materials. Meanwhile rubber band, eraser, plastic ruler and pencils are not attracted towards the magnet. They are called non-magnetic materials. Do you know that a magnet can attract objects that are made up of iron, or objects that have iron in it? The nails, pin, needle and key are made of iron. This shows that magnet attracts objects that are made of iron. Similarly, objects made of cobalt and nickel are also attracted by the magnet. Coins often contain nickel.

Poles of Magnet

Activity 9.5

Recognize that magnet has poles.

What you need?

- A bar magnet
- Some paper clips

What to do?

Place a bar magnet on a flat non-magnetic surface such as a wooden table. Cover it with paper clips. Now, carefully lift the magnet.

What did you observe?

The paper clips were mostly stuck at the ends. This shows that the magnet is strongest at the ends. The end parts where the magnet is the strongest are called the poles. One of the poles of a magnet is called the North Pole and the other one is the South Pole. Let us do the next activity to find out how like poles repel and unlike poles attract each other.

Demonstrate that like poles repel each other and unlike poles attract each other.

Activity 9.6

Investigate that like poles repel each other and unlike poles attract each other.

What do I need?

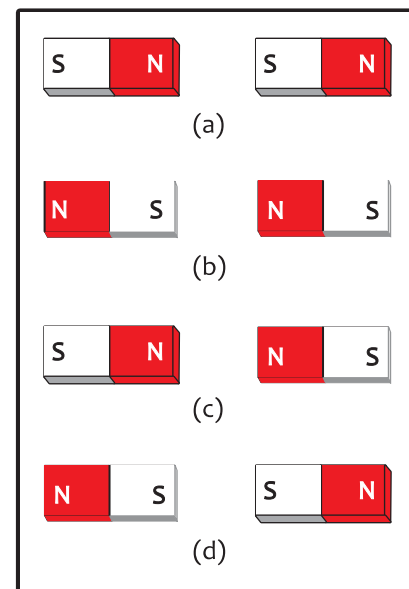
2 bar magnets

What to do?

- Take both the magnets and bring them in four different ways near each other, as shown in the figure right.
- Record your observations for each way in the table given below:

Fig: 9.9

What I observed?

	Repel or Attract
(a)	
(b)	
(c)	
(d)	

Activity Question

What would you conclude from the above activity?

Fig: 9.10

Activity 9.7

Investigate that a freely suspended magnet always points in the N-S direction.

A magnet has two poles; north and south, which always aligns with the earth's magnetic north and south poles. The freely suspended magnet linesup in such a way that one of its poles or the end one always point to the earth's North Pole. This end or pole of the magnet is called the north seeking pole or simply the North Pole; the other end or pole points to the Earth's South Pole.

Activity 9.8

Recognizing poles of a magnet:

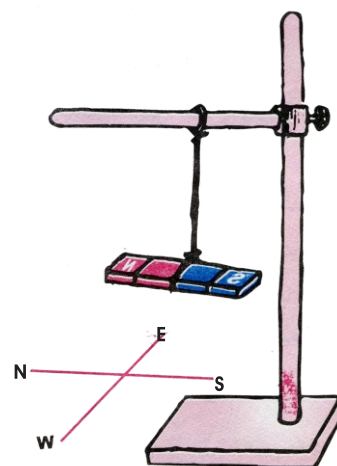
What you need?

- Two Bar Magnets
- A String
- A Stand Wooden with Clamp

What to do?

Tie one end of a string(about 1 meter long) round the middle of the bar magnet tightly.

Fig: 9.11

What did I observe?

A magnet's north pole points towards…….	A magnet's south pole points towards…..

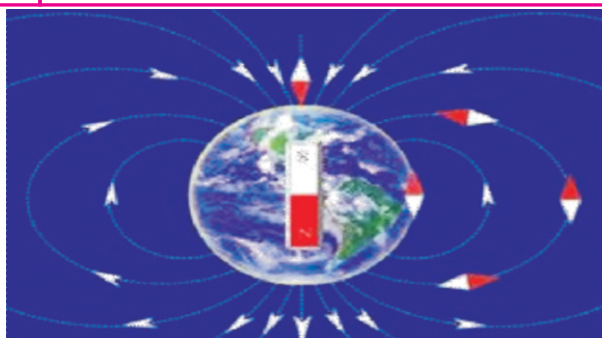
That Earth is also a large magnet with magnetic field and magnetic poles.

Earth is a giant magnet surrounding by invisible magnetic field lines. The magnet's pull is strongest at the poles

Fig: 9.12

Activity Questions

1. Which pole of the magnet points towards the Earth's north pole?
2. Which pole of the magnet points towards the Earth's south pole?
3. What would you conclude about the above activity?

Methods of Magnetizing and De-Magnetizing Materials.

How can materials be magnetized and de-magnetized?

- Apply ways to magnetize and de-magnetize materials.

An iron nail is attracted to magnets, but an iron nail attracts small metallic objects towards itself?

The answer is no.

An iron nail can be converted into a temporary magnet because all the molecules inside it become aligned in the same polar direction.

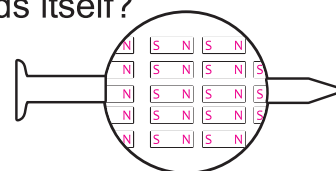



Figure 9.13
Magnetized iron nail.
All the molecules aligned in the same direction

Activity 9.9

Ways to magnetize an iron nail

The first method to magnetize a magnetic material.

What I need:

- A strong bar magnet
- An iron nail of about 4 inches
- Metallic paper clips or common pins

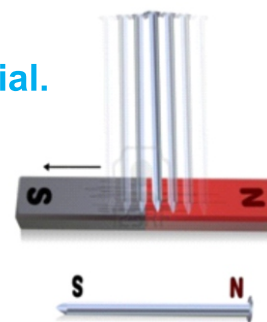



Figure 9.14

What to do?

1. Rub the bar magnet using its only one end either N or S, with the iron nail in one direction.
2. The magnet must be lifted completely off the nail after each stroke before beginning the next one.
3. Rub the magnet with the iron nail in this way about 20-30 times.
4. Bring some paper clips, iron nails, rubber band, keys, coins, pencil, needle, common pins, plastic ruler, eraser, etc., near the tip of the iron nail.

What I observed?

When the paper clips are brought near the iron nail after rubbing it with the magnet…

Activity Questions:

1. Why is it necessary to rub the iron nail in one direction in order to magnetize it?
2. What happened when paper clips were brought near an iron nail?
3. By using stronger iron nail, what will be the effect on the magnetism of an iron nail?
4. What can you conclude about the above activity?

Lodestone (also spelled loadstone) is a special type of the mineral magnetite. Do you know that a loadstone possesses north-south polarity? The Chinese were the first to use this mineral to make a compass?

Activity 9.10

The second method to magnetize an iron nail.

- An iron nail of about 4 inches
- An insulated copper wire
- One cell
- Pliers
- Paper clips or common pins

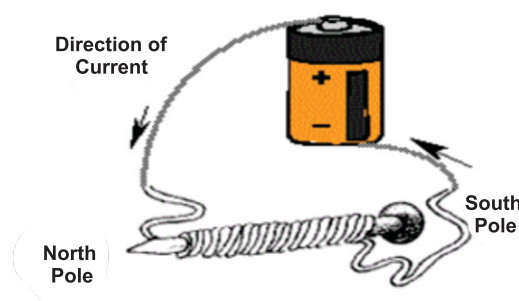



Figure 9.15

What to do?

1. Take an insulated wire and exposed its either ends with the help of pliers.
2. Wrap the wire around the nail by taking several winds along its length.
3. Connect the ends of the wire with the positive and negative terminals of the cell.
4. Bring some paper clips near the nail and record your observation.

What I observed:

When the paper clips are brought near the iron nail ……

Activity Questions:

1. What happened when paper clips are brought near the iron nail?
2. What will be the effect of increasing the turns of wire around the nail?
3. Can you think of other ways to increase the magnetism of the iron nail?
4. How can the magnetism of the iron nail be removed?

Ways to Demagnetize

- Apply ways to de-magnetize materials.

Magnets can be demagnetized by the following methods:

- Hammering
- Heating

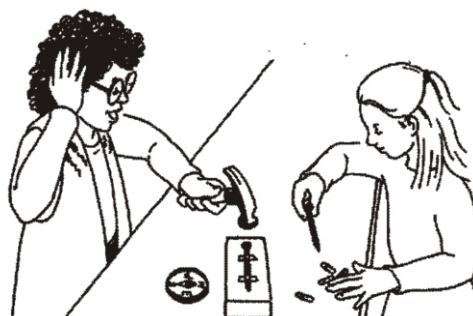
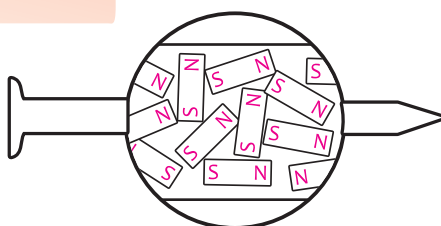
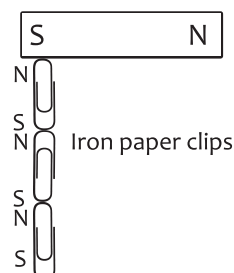



Figure 9.16 Demagnetized iron nail

Permanent and Temporary Magnets

- Differentiate between temporary and permanent magnets.

Temporary magnets

are those magnets which act like a permanent magnet. For Example, when they are under the magnetic field. When an iron nail is rubbed with a strong magnet, when electric current is passed around the nail in the insulated wire and when chains of paper clips are hung from a magnet, each paper clip magnetises the one below it.

Teacher's Note: The teacher needs to engage the students in class by demonstrating this activity.

Permanent magnets are those magnets which retain their magnetic properties for long.

Uses of Magnets

- Identify the various uses of magnets and magnetic materials in daily life.

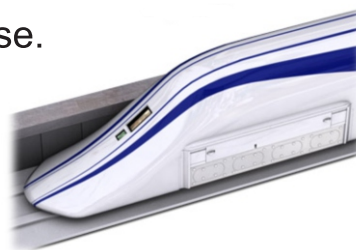
Fig: 9.17

Look at some objects. Are magnets used in these objects? Can you identify the use of magnets in daily life?

Magnets are used in many things in our daily life:

1. In computers, for the data storage purpose.
2. In industries, in sorting machines which separate iron and other metals from different objects.

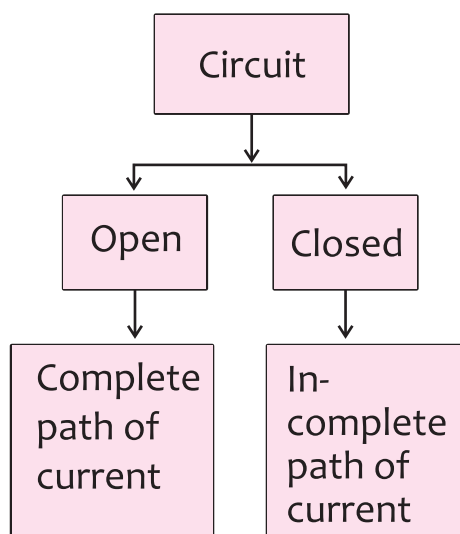
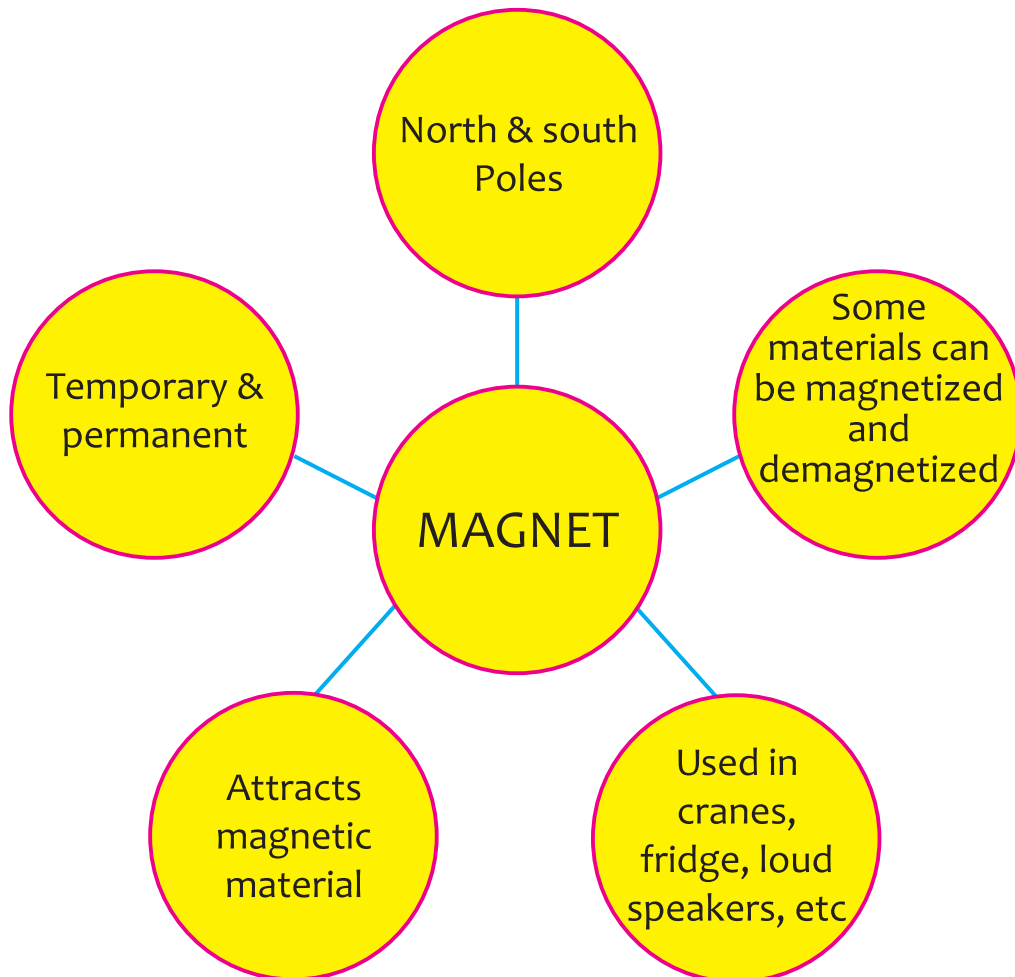
Fig: 9.18 Maglev train

3. Maglev Trains (MT) operate using two opposing magnets that cause the train to float, thus making it extremely fast.
4. In refrigerator doors, speaker and in cranes.

Loud speaker

Crane

Refrigerator

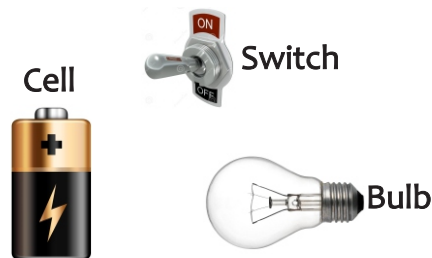
Summary

North & south Poles
Temporary & permanent
MAGNET
Some materials can be magnetized and demagnetized
Attracts magnetic material
Used in cranes, fridge, loud speakers, etc
Circuit
Open
Closed
Complete path of current
In-complete path of current

Review Questions.

1. Circle T for True and F for False in the following statements:
    1. Plastic wires are used in electrical appliances. T F
    2. A circuit is said to be closed when the switch is on. T F
    3. Current is the movement of positive charges. T F
    4. Steel is a non-magnetic material. T F
    5. Like poles repel each other. T F

2. List five conductors and five insulators in the table below:

Conductors	Insulators

3. Look at the given figure. Connect all the components with the help of a pencil to complete the circuit.

4. Circle the best answer.
    a) Which of the following will be attracted to the magnet?
        i) A rubber ball ii) A plastic
        iii) An iron kettle iv) An elastic band
    b) Which of the following can not be used to complete the circuit?
        i) Bulb ii) Wire
        iii) Wood iv) Battery

c) When the magnet is suspended freely, its north and south poles are always pointed towards

i) North and South poles of earth respectively.
ii) North and South poles of earth in the opposite direction.
iii) East and West of earth respectively.
iv) East and West of earth in opposite direction.

d) Which of the following methods can be used for magnetizing a steel rod?

i) By heating it on a high flame
ii) By passing an electric current around it
iii) By hammering
iv) By keeping it with an iron rod

5. Differentiate between the following in one to two sentences:

i) Open and closed circuit.

ii) Permanent and temporary magnets.

iii) Magnetic and non-magnetic materials.

iv) Conductors and insulators.

6. Write **Three** uses of magnets in daily life.

Project:

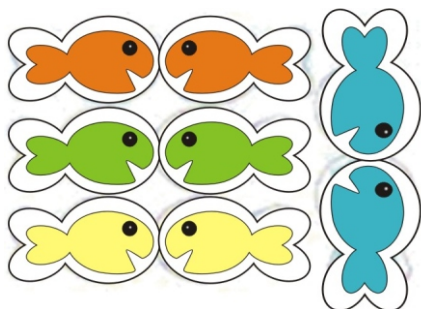
- Take magnets of different shapes, for example, horse shoe, bar, round, etc.
- Hide their marks of north and south poles.
- Investigate their poles by repeating the activity 7.

Fun with magnets: Making a Fishing Rod

Materials required:

Some coloured plastic bags, coloured markers, steel paper clips, a horse shoe magnet, a 12 inch string, a tape and a wooden stick.

Procedure:

1. Draw small shapes of fishes on the plastic bags and cut them out carefully. You can use a double plastic to make your fishes firm.
2. Decorate your fishes with coloured markers. Draw face and scales on one side and write different numbers on the other side.
3. Attach paper clips firmly on each fish.
4. Tie one end of the string to the middle part of the magnet and another to the one end of the wooden stick. Use tape on both ends of the string to make it strong.
5. Your fishing rod is ready.
6. Pour water in a bowl and put all your fishes, face side up, in the bowl.
7. Now you can start fishing with your friend and set the time.
8. Lower your rod in the bowl and catch the fishes. The paper clips will be attracted to the magnet.
9. Catch all the fishes and count the numbers. The highest scorer will win.

CHAPTER 10

MOVEMENTS OF THE EARTH

In this chapter you will learn about:

- The Earth
- The Earth's Spinning
- Day and Night
- Revolution
- Seasons

All the students will be able to:

- Describe the shape of the Earth.
- Relate the Earth's spining with the occurrence of day and night.
- Define the term revolution.
- Identify that the distance between the Earth and the Sun effects the time.
- Earth takes time to revolve around the Sun.
- Explain that the Earth is titled on its axis and this tilt causes seasons.

Have you ever thought about the place of the Earth in the Solar System? Where could we find life form in the solar system? What is the shape of the Earth? Why does the Earth look flat?

The earth is the third planet of our solar system. It is the only place full of life in every form. It is the only planet with green plants and animals. This is the only planet with water in three forms.(solid, liquid and gas.

Figure 10.1 View of the Earth's form from outer space

As seen from outer space, the Earth looks like a bright blue ball. The blue is water, which covers most of the surface of the Earth. Clouds and bodies of ice, such as Antarctica, appear white, while land forms look brownish.

The Earth

While standing outside, we see it as a flat surface covered with sky from everywhere. But the Earth is not flat. The Earth has a spherical shape. Do you know why it looks flat? It looks flat because of its hugeness in comparison with us.

Activity 10.1

How to get a spherical impression of the Earth's surface while standing on it?

Go to seaside and try to observe a sailing ship coming off the shores. Observe closely and explain your observation of what you saw first.

We first see the fins of the ship and then the bottom of the ship. This is an indication of the spherical nature of Earth's surface. Otherwise, the whole ship should become visible at once on a flat surface.

Earth's Spinning and Day and Night

When you wake up in the morning where do you see the Sun?

Do you find the Sun at the same position in the afternoon?

Is it at a similar position in the evening?

Have you observed the moon?

Have you observed the stars?

Do they also change their position as time passes?

Do you think all these bodies (Sun, moon and stars) are moving from east to west each day across the sky?

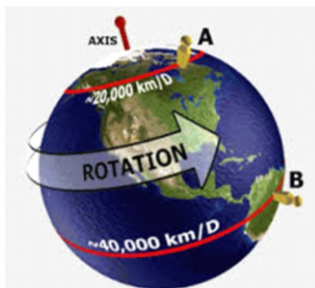
Activity 10.2

How to experience that the Earth is moving?

Figure 10.2 Moving Train

When you are travelling in a bus or train, what do you see when you look out of the window? Do the objects outside seem to move? In which direction do they seem to move? Are the objects really moving?

Compare this situation with the movement of the Earth. You will be able to realize that the Earth moves from west to east and so all objects in the sky, sun, moon and stars seem to be moving in the opposite direction that is from east to west.

Figure 10.3 Rotation of the Earth

The sun, moon and the stars seem to rise from the east and set in the west because the Earth rotates from the west to the east. What does the rotation of the Earth cause? Observe the picture and talk to a friend.

The Earth is a sphere. It rotates on its own invisible axis, which passes through the North and the South Poles. The Earth has poles, hemispheres and an equator.

Activity 10.3

Find out the causes of the rotation (spinning of the Earth on its axis)?

What do you need?

1. A globe or a knitting needle pierced through a rubber ball.
2. A torch.

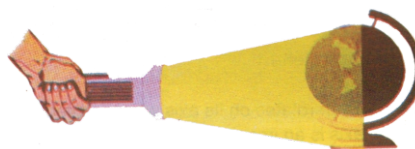



Figure 10.4 Demonstration of Day and Night

Throw light of a torch on one side of the globe.

Teacher's Note: The teacher could bring in topples and different toys for children to play with and experience the spinning and direction of moving bodies and stationary objects.

What do you observe?

We see that the side of the globe facing the light coming from the torch is bright while the other side is dark. Now, turn the globe slowly in an anti-clock wise direction.

What do you observe?

Did you observe that the dark side of the globe starts becoming bright? The bright side goes into the darkness. This is called rotation which is also known as the spinning of the Earth.

As the earth rotates or spins on its axis, our part of the earth moves away from the sun. The other parts of the earth become bright. When our side of the Earth has day time, the people living on the other side have night time because Sun rays are not shining on it.

Pakistan and Canada are on opposite sides of the Earth. Can you tell what time is in Pakistan when it is day time in Canada. In the above activity, the needle through the middle of the globe represents its axis on which globe is rotated. The axis of the Earth is an imaginary line.

The rotation of Earth on its axis is called axial rotation. It causes day and night. The Earth completes one rotation in 24 hours (which equals to one day).The axis of the Earth is slightly tilted.

Revolution:

We have learnt that the Earth is a sphere. It rotates on its own invisible axis, which passes through the North and South Poles. This axis of the earth does not point straight up. The axis is slightly tilted.

There are eight other planets also in the solar system.

- Define the term revolution.
- Identify that the distance between the Earth and the Sun effects the time the Earth takes to revolve around the Sun.

The Earth also has poles, hemispheres and an equator. At any time, one half of the Earth is facing the Sun. In that half, it is day. The other half is facing away from the Sun. This half does not receive sunlight. In that other half, it is night.

The Earth rotates on its axis. It takes one day or twenty-four hours to complete one rotation. It is night on the part facing away from the Sun. It is day on the part of the Earth facing the Sun. Rotation causes day and night. The Earth rotates constantly and in the same direction, that's why the Sun always rises in the east and sets in the west.

Why is our calendar not 365 days and 6 hours long? What happens to the 6 hours?

Do you know what the Earth's revolution and tilt cause?

The Planet Mercury that is closest to the Sun takes 88 days to complete one revolution.
The Earth takes 365 days and 6 hours. Meanwhile, Jupiter takes 4332 days to complete one revolution.

Activity 10.4

How to find out the causes of the revolution and tilt of earth?

What you need?

- Paper with Squares
- Torch

What to do?

Take a paper and make squares on it. Now shine a torch light on it pointing straight down, as shown in the picture. Count the number of squares that become bright from the torch light. Then tilt the torch a little keeping it at the same height, as shown in the picture.

Figure 10.5 Pointing light onGraph

Again, count the number of squares lit by the torch light.

What did you observe?

Light Pointing Straight	Number of Square
Light Tilted	Number of Squares

Did you count more squares or the same number of squares? That's right. More squares are lit up when the light is slanted than when it is directly pointed. As the light spreads out over a greater area, the heating effect is less.

- Explain that the earth is tilted on its axis and this tilt causes seasons.

Seasons:

Most of us probably live an indoor and in-town life, a life removed from everyday happenings in the sky. We do not observe that pattern in the sky marking the changing of seasons, monsoon, the movement of herds and the planting and harvesting of crops.

Do you know that all this is because of the tilt of the Earth at its axis which is about 23.5 degrees?

The Earth’s axis, is an imaginary line at which the Earth rotates, connecting two poles called the North Pole and the South Pole. It is because of this tilt that different amounts of sunlight fall on different parts of the Earth, causing variations in the duration of day, night and the seasons.

21st or 22nd March marks the point of spring for the people living in the northern hemisphere of the Earth whereas autumn in the southern hemisphere of the Earth. At this time, both the hemispheres receive similar amount of

sunlight and the length of the day and night is the same at all places of the Earth, as shown in the pictures.

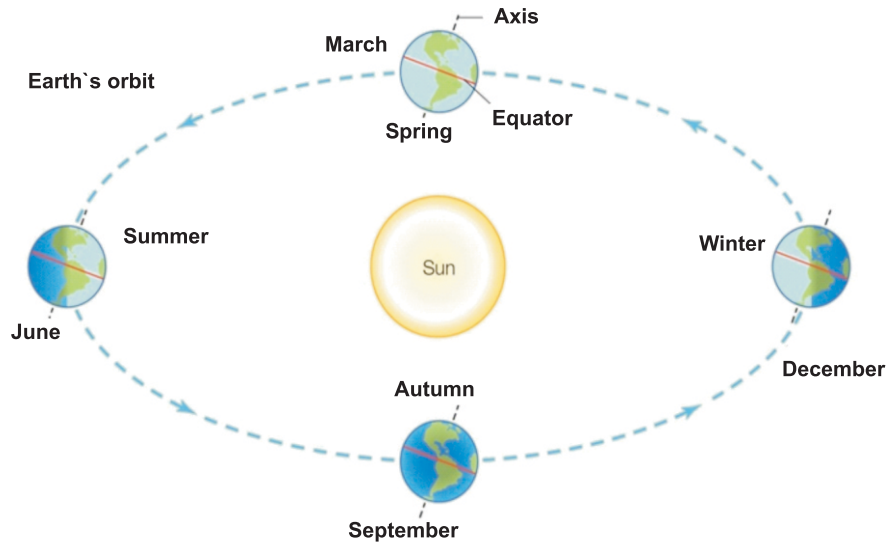



Figure 10.6 Seasons

21st and 22nd June marks the point of Summer in the northern hemisphere and winter in the southern hemisphere. The length of the day becomes longest for the northern hemisphere and shortest for the southern hemisphere.

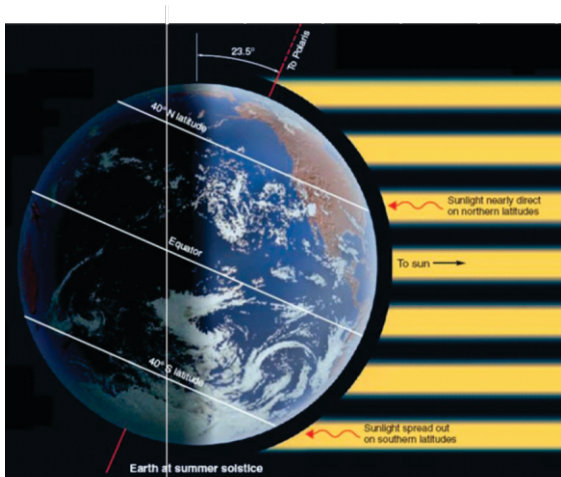



Figure 10.7 The Earth at Summer Solstice

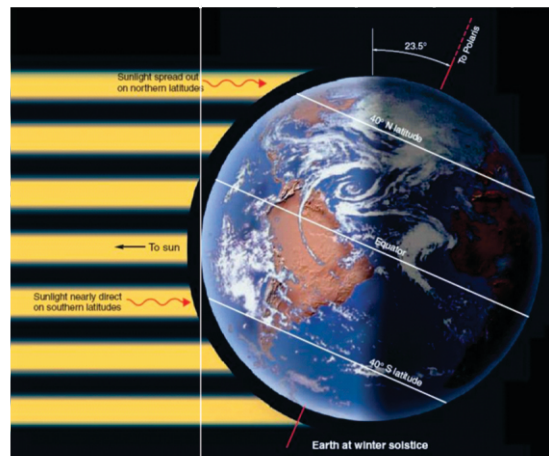



Figure 10.8 Earth at Winter Solstice

22nd and 23rd September marks the reverse of the situation at 21st or 22nd March, whereas autumn season in the northern hemisphere and spring in the southern hemisphere start.

Again, the length of the day and night becomes equal for both the hemispheres.

21st or 22nd December marks the reverse situation as it happened in 21st or 22nd June where there is winter season in the northern hemisphere and summer in the southern hemisphere. Then the length of the day is shortest in the northern part of the Earth and longest in the southern part of the earth.

Activity 10.5

Read and complete the text in pairs. Complete the following text in pairs using the words below.

The Earth is our ____________. The Earth has two movements: ___________ and ________________. Revolution is when the Earth revolves around the __________.This process takes one year and six hours. Revolution causes the ___________. There are four seasons: spring, ____________, autumn and __________. In summer, it is ________ than the rest of the year. Days are _______ and nights are ________. In winter, it is ________ than the rest of the year. Days are shorter and nights are longer. ________ is the season between winter and summer and _______ is the season between summer and winter. In spring and autumn, days and nights are almost of the same length.

Colder Longer Seasons Summer Shorter
Rotation Sun Spring Revolution Hotter
Autumn Planet

Teacher's Note: The teacher should show the pictures and explain different parts, effect of direct/indirect sunlight and seasons to the students.

Review Questions:

1. Circle T for True and F for False statement. Provide a correct statement for the False Statement.

i) The Earth is not a sphere. T F

ii) The Earth has poles, hemispheres and an equator. T F

iii) The Earth has only one movement called rotation. T F

iv) Rotation takes one year and six hours to complete. T F

v) Revolution takes 24 hours to complete. T F

vi) It is night in the part of the Earth facing away from the Sun. T F

vii) Revolution causes the seasons and day and night. T F

viii) When a hemisphere is tilted towards the Sun, it is summer because it receives more sunlight. T F

ix) On 21st or 22nd March, length of the day and night becomes equal for the southern and the northern hemispheres. T F

x) The Earth has no poles. T F

2. Word search:

In pairs, look for the following words in the words search. Use the language in the box to interact with your classmate.

A	T	I	B	R	O	P	A	Q	E	S	S	O	B	D
R	O	T	A	T	I	O	N	Q	E	V	P	Y	A	O
Q	Q	B	D	O	G	L	U	R	Q	G	H	Y	P	I
G	X	K	T	O	G	A	E	A	Y	A	E	T	H	E
T	H	G	I	N	T	H	S	Z	X	S	R	V	K	F
U	Q	M	W	O	P	G	F	N	D	I	E	C	N	W
T	N	L	R	S	V	B	F	P	O	R	S	P	S	J
D	O	G	I	P	W	C	N	F	W	S	Q	J	N	V
N	W	M	Z	U	V	B	J	D	Q	V	A	U	X	I
A	E	N	A	H	G	M	F	U	Y	K	V	E	Z	J
H	C	C	P	T	W	O	G	B	J	T	N	Q	S	Q
H	D	M	H	W	D	J	A	W	V	Q	M	Y	K	S
E	D	E	R	V	X	Z	Z	U	S	X	Q	X	P	Z
L	G	F	N	S	K	D	I	X	D	B	M	Y	X	S
E	G	Z	R	W	P	Z	T	S	E	L	O	P	Q	T

THE EARTH AXIS DAY EQUATOR HEMISPHERES
NIGHT ORBIT POLES ROTATION SEASONS SPHERE

3. Circle the Best response :

i) The Earth is tilted at an angle of __________.

a) 23.50^{o} b) 23.0^{o} c) 23.08^{o} d) 23.30^{o}

ii) The Earth takes _____________ hours to rotate on its axis.

a) 36 b) 25 c) 24 d) 24.8

iii) In ________, days become shorter and nights become longer.

a) Summer b) Spring c) Autmn d) Winter

iv) In ________, days become longer and nights become shorter.

a) Spring b) Autumn c) Summer d) Winter

v) The orbit of the Earth in an elongated circle is called _____.

a) Ellipse b) Parabola c) Hyperbola d) Oval

vi) The Earth takes _________ to revolve around the Sun.

a) 360 day and 12 hours b) 370 days and 10 hours
c) 365 days and 15 hours d) 365 days and 6 hours

vii) The Earth's axis is an imaginary _____________.

a) Line b) Square c) Circle d) Dot

viii) In that half of the Earth which is facing the sun, there is

a) Winter b) Night c) Day d) Both A & B

ix) The Earth is rotating constantly and in ________ direction.

a) South b) North c) Same d) East

4. Double Puzzle

Correction the spelling of the words and arrange the sentence.

TOTIRNOA

18	15	20	1	20	9	15	13

SAUSEC

3	1	21	19	25	19

YDA

4	1	25

NAD

1	14	4

HINTG

14	9	7	8	20

Inquiry Project:

Material Required

- Balls of different sizes
- Strong thread
- Cardboard
- Masking tape
- Small beads

Procedure

1. Take 9 balls (8 planets and 1 sun) in different sizes.
2. Cut a circle in a cardboard and cover the bottom of the cardboard with a blue construction paper.
3. Then take some strong thread in the hand sewing needle and tie the small balls.
4. Take small pieces of papers and write the names of the planets and then attach them with balls.
5. After attaching all the planets to the cardboard, glue the top of the cardboard with a blue paper.
6. Attach the flower wire as a ring for Saturn. Also, use it to make a hook in the cardboard to hang the planets.